

SCIENCE

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FRIDAY, JULY 6, 1883.

FIELD-CLUBS AND LOCAL SOCIETIES.

WITHIN the last twenty years there have been a good many experiments made in this country towards the development of science in districts where access to public instruction, in the way of lectures and large museums, was not to be had. Some of these efforts have been successful, but many of them have failed, principally from a want of understanding of the conditions that make success possible. There are few country towns, in this or any other land, where it is possible to maintain an academy patterned on the great societies. Such institutions can only do good when they are sure of the support of many earnest workers, — of men to whom science is a matter of all-absorbing interest. Very few *societies* can be maintained without a system of publication which is very costly, and often of no measure of utility compared with their expense.

To make a society successful there must be a distinct object for it to attain, — one which is well within the reach of such efforts as its members can bestow upon it. The success must be of a tangible sort, — one that is constantly and readily attainable, and in which many can take an active part. In the great societies of the world, this end is honor, or at least notoriety, that may simulate the nobler motive. In a village, a town, or even a provincial capital, neither of these ends can be had with sufficient certainty to secure the talent that is open to temptation. So the local society languishes, or, doing better by itself, dies out altogether.

There is another form of associated action among the lovers of science that escapes the

dangers of the more pretentious associations which take the name of society or academy. This is found in the field-club or purely local society, which proposes for itself the study of the problems that lie at the very thresholds of its people. Such associations have already proved wonderfully successful in the old world. They abound in England, and are numerous on the continent. They have found a place in the affections of the people, and a certainty of continued life, where academies have dwindled away.

We do not have to look far into human nature to see why this success has been gained. It is happily natural for men to take more interest in near than in remote things. The primrose by the 'rivulet's brim,' provided it is one's own rivulet, is more interesting than the Victoria regia of far-off wildernesses. The geology of the township where a man lives is more interesting than that of the Colorado cañon, which has never concerned him. So it is that any association for the study of near things has a certainty of support that cannot be secured for any general work in science; and field-clubs which try to promote the study of a township, or at most of a county, are likely to find a support that surprises their founders.

Then, if the proper method be followed by these clubs, there enters into their life an element of the holiday which is very far from the senatorial methods of the more dignified society. Their meetings should be principally in the outer air; for they thus secure the best that the study of nature can give, something of the freshness of woods and field, and the cheerful contact with other fellow-mortals beneath the open sky, — a relation that has a charm that is denied within four walls.

Wherever there is a single zealous student

of nature, there is the germ of such an association. He or she can easily gather together a dozen of boys and girls, men and women, who will find in open-air inquiry a rich reward for all the time and force that such activity demands. There should be as little of the machinery of a society as the circumstances will admit: a council of three to five persons to direct the scheme of studies, and a secretary, will serve all the first needs of the association. A few winter-time meetings will find an interest in the discussion of the problems that the neighborhood affords, in the review of work that has been done, and of work there is to do; but the most of the work should be done in the field-meetings.

When there are enough engaged in the work to warrant it, it will perhaps be well to have particular inquiries placed in special hands. Each field-meeting should be for some particular end or ends; and, after the field-work is done, the members should be gathered together, still by preference in the open air, for a discussion of the results obtained.

In those cases where the circumstances admit, it is well for such a society to begin the making of a little museum devoted to the illustration of the field with which they have to deal. The cost of such a collection need not be great; and the utility of the work is very great, provided it be not too much of a burthen to the association. It would best not be undertaken unless the club can see its way to a well-assured income of at least five hundred dollars per annum, beyond the rent of a room where it is deposited. Generally it will be possible in towns of any size, and where public spirit reigns, permanently to secure a room in some schoolhouse or library building, large enough for the needs of the little museum. The walls of a room twenty by thirty will serve for the storage of specimens for many years, and its floor-space will be great enough for meetings in the winter months.

The first thing to be secured is as good a map as can be obtained, on a tolerably large scale, of the region to be studied; for the

awakening of the geographical sense of the members is one of the best results that can be obtained by a field-club. In proper time this map can become the place of record of a great deal of fact which cannot be represented by the specimens that may be gathered from the field that it represents.

The five hundred dollars' revenue upon which such a collection should always rest will serve, with due economy, to provide shelves for the collections, to meet the cost of alcohol, bottles, etc., and pay the trifling other charges of the society.

While it is best that the work of such a society should be thoroughly autonomous, — that the motive for its prosecution should come from the people themselves, — it will at times be well to secure the aid of some one specially trained in such problems as its field affords, in the way of suggestions concerning work to be done. Many naturalists will be glad to give aid in this way, either by a lecture, or by written advice. Every field affords problems in geology, botany, entomology, etc., the solution of which is within the limits of the simplest research if it only be patient and truth-seeking in spirit. More of the future of natural history lies in the prosecution of such inquiries than in all the work that can be done in the closet.

Such collections, as soon as they are begun, will at once command the attention of working naturalists. They are sure to be visited and studied; and this interest they arouse will, in itself, pave the way to a quickened life, and better inquiry on the part of the members of the club.

When these societies become numerous enough, — when there are a dozen working in New England, for instance, — it will be well to have a little joint action among them, such as could be obtained by an annual meeting of representatives from them, for the discussion of methods and of problems to be jointly investigated. The interesting experiment of a state meteorological system in Missouri has shown how useful local observers can be in this science. It might be well for the societies to

arrange for some common system of observation in this branch. So with each of the sciences: conjoint action would solve many problems that are of the highest interest.

Then, again, there would be a great influence on the extension of science-teaching in the public schools, that would certainly come from the existence of such local societies. The greatest danger that now menaces natural science is, that the parrot system of teaching, so long applied to other branches of learning, will be taken in science-teaching. The presence of a little band of actual inquirers in any town will be the best possible assurance against this. Let the children have some share in the open-air actual study, and the evil of the book-system will surely be mended in part; for its imperfections will be seen.

It will often be possible to organize such a club in immediate connection with the schools of the town where it started. Experience in Europe shows that children readily and zealously engage in such inquiries, and need only a little direction in their work.

However we look at it, we see much to hope from the extension of the field-club system of science study.

THE NATIONAL RAILWAY EXPOSITION.

I.

THE exhibition of railway appliances now being held at Chicago is probably the most complete collection of all the varied apparatus used in every department of railroad working and construction that the world has ever seen; and the management are to be congratulated, that, while little has been omitted to make the show complete, still less has been included which is foreign to the subject of railroads. The exhibits range over a wide field, from uniform-coats to steel rails, railroad officers' desks to revolving snow-ploughs, and from an electric railroad in full working, and earning quite handsome traffic receipts, to George Stephenson's first locomotive, which is shown by an English railway company.

The main questions which are now awaiting solution in the railway world are well represented in the exposition. The cheap transport of heavy freight-trains over steep grades,

the conveyance of perishable articles, such as meat and fruit, and the control of the *vis viva* or momentum of trains, are all questions which have to a certain extent been solved; and further developments of these solutions are shown. A locomotive of unprecedented size and power, fitted with a valve-gear of novel construction, which yields excellent results, is shown by the Southern Pacific railroad, and a large number of fine engines are shown by the Brooks and other locomotive works. The exhibition of refrigerator cars is very complete, and most of them appear to be of simple and efficient design. Continuous brakes, applicable to freight-trains, are exhibited; and as some of them appear worthy of careful examination, we shall refer to them later on.

While there can be no doubt, that as regards cheapness and rapidity of construction, general excellence of bridges, locomotives, and cars, the railways of this country are ahead of the rest of the world, the signalling arrangements here, with few exceptions, are rudimentary and inefficient, and render fast travelling a matter of considerable difficulty, if not danger. It is impossible to run a really fast express-train if the signals are ambiguous, and if every level crossing is made a compulsory stopping-place. The saving in time by fast trains can only be fully felt in a great country, where very long journeys are not only possible, but are frequently undertaken; but hitherto this fact has been little appreciated, and people have been content to travel at a slow speed, and put up with frequent stoppages, because the railways were new, the rails roughly laid, and many bridges unsafe at a high speed. But of late years these conditions have been materially changed. The wide-spread use of steel rails, the greater care bestowed on the road-bed, and the introduction of iron bridges of first-class workmanship, have rendered high speed perfectly safe and easy on most parts of good roads in the eastern and middle states; but it is rendered unsafe where switches are so arranged that they may be left open to an approaching train without any signal warning the engineer, or the signals are so formed that the difference to the eye between a clear or all-right signal and a danger or stop signal is slight in snowy weather or under certain atmospheric conditions which render the difference between colors imperceptible, though a difference in form may be perceived.

The exposition is, however, especially strong in signal apparatus; and there can be little doubt that the most important result of the exhibition will be the wide-spread adoption

of some of these safety appliances, rendered necessary by the increased number of trains, and the fact that the thicker and more numerous population now demands both safer and faster travelling. The real gain of time to a business-man, obtained by a difference of a few miles an hour in the speed of a long-journey train, is best illustrated by an actual case, — a man in New York who wishes to do a day's work in Chicago. He takes one of the fastest and best appointed trains he can find, — the Chicago limited. It leaves New York at nine A.M., and lands him at Chicago at eleven the next morning, having accomplished nine hundred and eleven miles in twenty-six hours fifty-five minutes, allowing for the difference in time between the two cities. This makes an average speed of 33.8 miles per hour, including all stoppages. But assume, what is surely not extravagant, that as high a speed can be attained on the Pennsylvania or any other first-class American road as on an English main line, and what shape does the problem assume? On one English road, the Great northern, the distance between Leeds and London (a hundred and eighty-six miles and three-quarters) is done in three hours forty-five minutes, including five stoppages; on another, the Great western, the hundred and twenty-nine miles and three-quarters between Birmingham and London is run in two hours forty-five minutes, including two stoppages; and as neither of these routes is particularly level or straight, and both pass through numerous junctions with a perfect maze of switches and frogs, they give a fair idea of what is possible in speed on the railroads of this country. These figures give, respectively, speeds of 49.8 and 47.2 miles per hour. Taking as a fair average forty-eight miles an hour, including stoppages, the journey from New York to Chicago should be done in eighteen hours fifty-nine minutes, or, say, nineteen hours, — a saving of seven hours fifty-five minutes on the present time; so that, if the train were arranged to leave at fifty-five minutes past four in the afternoon instead of nine o'clock in the forenoon, the whole of this time would be saved in the busy part of the day, effectually adding a day to our imaginary traveller's business and dollar-making life.

It may be thought that such a deduction is unfair, as the English style of car is so much lighter than the American; but, as a matter of fact, the average English express-train is considerably heavier than the Chicago limited, and conveys about three times the number of pas-

sengers; and, as trucks and oil-lubricated axle-boxes are not yet universal there, the tractive resistance per ton is probably higher. It certainly, therefore, seems not only possible, but feasible, to attain these high speeds in this country, where, owing to the long distances to be travelled, they are more valuable than in England; and the great step towards attaining that end is the adoption of proper and efficient signalling arrangements. All the other steps are achieved: the American passenger locomotive of the present day is perfectly competent to drag a heavy train at a speed of over sixty miles an hour; the cars, as now constructed, can travel safely and smoothly at that speed; and the steel rail, the well-ballasted tie and perfect workmanship of the modern iron bridge, can well support the thundering concussion of an express-train at full speed. But this speed can only be maintained for a few miles at a time if the engineer who guides this train be doubtful whether that dimly-seen signal imply safety or danger, or if the laws of the state bring him to a full stand where his road is crossed by a small corporation with a high-sounding title, which owns one locomotive with a split tube sheet and two cars down a ditch.

To run a fast train, a clear, uninterrupted road is absolutely necessary; and the reason is not far to seek. To move a body from a state of rest to a velocity of sixty miles per hour or eighty-eight feet per second, an amount of work must be performed equivalent to lifting that body a hundred and twenty-one feet. Now, it is apparent to the simplest capacity that it requires a pretty powerful engine to overcome the resistance of a train running at sixty miles per hour without every few miles putting on brakes to destroy this velocity, and then to lift it a hundred and twenty-one feet again to attain speed; the resistance of the air, and the friction of bearings on journals and of flanges against rails, going on all the time. As a matter of fact, showing what severe work this is on an engine, the Zulu express on the Great western railway of England, which is the fastest train in the world, has been repeatedly carefully timed; and it is found, that, though running over an almost absolutely level and straight road, it takes a distance of twenty-six to twenty-eight miles to attain its full speed, about fifty-eight miles and a half an hour.

The adoption of a safe and thorough system of signals, efficiently warning the engineer of a train of any danger in his path, whether from a misplaced switch, an open draw, or a

freight-train ahead, may be regarded as of great importance to the American railroad system, in a manner crowning the edifice, and enabling roads to be operated with greater speed, safety, and regularity.

(*To be continued.*)

**THE INFLUENCE OF GRAVITATION,
MOISTURE, AND LIGHT UPON THE
DIRECTION OF GROWTH IN THE
ROOT AND STEM OF PLANTS.**

MEMBERS of my present botany class have performed some experiments this spring, bearing upon the above caption, which, although not developing any thing new in the interest of the extension of experimental methods in the lower schools, it seems to me may be found worthy of a record in the columns of SCIENCE.

Seven balls of moss, about four inches in diameter, were prepared, in the centre of which were planted from fifty to a hundred grains of oats, barley, or corn; in some cases a mixture of two of these grains.

No. 1 was suspended in free air, lighted on all sides. No. 2 was placed on a glass tumbler, in the bottom of which some water was kept, but not enough to rise within two inches of the lowest part of the ball. No. 3 was fitted into the mouth of an inverted bell-glass in such a manner that one half of the ball was within the jar and one half without it. No. 4 was placed one half within and one half without a bell-glass placed in a horizontal attitude. No. 5 was in a tight tin can, the ball fitting it like a stopper, so as to exclude the light and to prevent a circulation of air. One-half of the ball protruded from the can, and the can was inverted. No. 6 was placed in a can similar to that of no. 5; but this was placed in a horizontal attitude, as in no. 4. No. 7 was mounted upon a spindle running through its centre. The spindle was attached to the stem of the minute-hand of an eight-day clock in such a manner that the axis of the spindle was a continuation of the axis bearing the minute-hand of the clock. The spindle was a piece of one-eighth inch brass wire having a strip of tin soldered to one end of it. The tin was perforated with a square hole, exactly fitting the shaft of the minute-hand of the clock. The other end of the wire was filed down to form a small journal, which worked in a hole bored in a lump of solder secured to the end of a wire which acted as a support to the distant end of the spindle. This supporting wire was first bent double, forming a narrow

V, and the solder, which served as a box for the journal, dropped in the vertex. The two arms of the V were then bent upon themselves in the same direction so as to form a right angle with the plane of the V. Two holes were bored in the frame of the clock above the dial, but close to it, and the arms of the bent V inserted. The minute-hand was then removed from the clock, and also the washer behind it. The tin shoulder of the spindle was then placed upon the shaft, and the minute-hand replaced; the shoulder serving in the place of the washer, which had not been replaced. It was only necessary to shorten the pendulum a little to enable the clock to record time with its usual regularity.

The results observed after germination were as follows:—

In no. 1 the stems all came out in a clump at the top of the ball, and the roots in a cluster from the under side. The roots, however, after protruding from half an inch to an inch, curved upon themselves, and re-entered the ball, or else withered. In no. 2 the stems all came out at the top, and the roots at the bottom; but the roots in this case continued straight downward into the water, no one of them turning back into the ball. In no. 3 the plants departed themselves in all respects as those did in no. 1, except that the growth was very much more rapid. In no. 4 all of the stems except two came out of the ball into free air: two grew horizontally into the bell-jar. A large cluster of the roots came out of the ball and entered the jar, and continued to grow horizontally, only depending so much as was necessary by their own weight. Others of the roots emerged from the lower side of the outer half of the ball, but soon entered it again. In no. 5 all of the stems came up in the dark, damp atmosphere; and the roots emerged from the lower side of the ball, but re-entered it again, or else perished. Many of the stems (oats in this case) threw out a pair of opposite bodies, apparently secondary rootlets, which grew horizontally, in all cases observed, to a length of about one inch. The color of the stems in this case was a pale yellow. In no. 6 all of the stems came from the ball upward into the light, and very many of the roots protruded horizontally into the can, some of them leaving the ball above its centre. A corn-root extended itself horizontally four inches beyond the surface of the ball, and in that distance was only depressed one-half of an inch. On the corn-roots back of the sensitive tips, the delicate root-hairs were so numerous and long as to give it a resemblance to the hair-brush for

cleaning lamp-chimneys. In this ball a number of roots also emerged from the lower side of the ball, but only to re-enter it again, as in the other cases. In no. 7 stems and roots came out together indiscriminately, and from all sides of the ball; the roots, however, after protruding from half an inch to an inch, re-entering the ball or withering. This experiment was twice repeated. In the first case more stems appeared from the side of the ball away from the face of the clock, and the greater number of roots made their appearance on the opposite side of the ball. It was observed in this case, however, that the spindle slanted about two degrees toward the clock. In the next experiment the spindle was made horizontal, and no difference as to place of emerging of root and stem was observed.

These experiments in combination appear to show with clearness the influence of moisture and gravitation in determining the course of the root, and to suggest that the influence of moisture is the stronger of the two.

The emergence of the sensitive tips of the primary roots from the damp ball into the dry atmosphere I suppose Darwin would have explained as the result of the persistence of the impressions in the root behind. The horizontally extending roots in the damp atmosphere, both dark and light, suggest that the response to gravitation in both cases was *nil*. May it not be true that the diageotropism of roots is such in no other sense than that of direction of growth? that it is in reality simply a growing toward the proper amount of moisture? This would appear to explain the oblique direction of secondary branches, and the largely indifferent direction of tertiary ones. The balls in the jar, placed in the horizontal attitudes indicate that the stem does not grow simply in a direction opposite to that of the principal root, for they were turned toward each other through an angle of nearly ninety degrees. The two inverted jars show that the stems did not seek a dry atmosphere, for in both cases they grew up into that which was more moist. The inverted dark jar shows that the effect of the impact or absorption of light on the lower half of the ball, and the absence of these effects upon the upper half, did not produce a sufficient contrast to guide the stem into the light; but since, of the two jars placed in the horizontal attitude, only the ball in the mouth of the glass one sent stems into the jar, it seems possible, since other conditions were alike, that light may exert a small influence in guiding the stems from the ground.

F. H. KING.

River Falls, Wisconsin, May 17, 1883.

SOME GLACIAL ACTION IN INDIANA.

WITH members of my class in geology, I have been examining the glacial deposits in this vicinity (Montgomery county). Our chief water-course is what is called Sugar Creek, a tributary of the Wabash River, which occupies a valley with a general south-westerly bearing, virtually the same trend which the Wabash has across the state before it makes its sharp bend to the south. Along the valleys of the Wabash and Sugar Creek, there are abundant evidences of a glacier which moved in the direction of the valleys, and is known as the Lake Erie glacier, as it advanced in the direction of the axis of that lake, and so up the Maumee, and across the low divide at Fort Wayne, into the Wabash. Sugar Creek itself has been compelled to bend sharply to the south a few miles to the west of us by the deposits of this old glacier, and has cut its new channel through the soft subcarboniferous sandstone. At one place in this county, where the creek still occupies its preglacial valley, it cuts through what we formerly considered a large terminal moraine, which lies squarely across the valley. Recent floods have swept away some of this moraine, and laid bare the country rock. This rock is found to be smoothly planed, and absolutely covered with glacial scratches all trending N. 20° W., or almost at right angles to the valley of the creek and the course of the former glacier. These scratches of the second glacier are now found in many places throughout the county; and our old terminal moraine proves to be a medial moraine, and bears upon its back a line of huge boulders with the same north-westerly trend. These facts are recorded here in the hope that they may be of some use in the consideration of a much-vexed question.

JOHN M. COULTER.

Wabash College, Crawfordsville, Ind.

THE UNITED STATES FISH-COMMISSION STEAMER ALBATROSS.

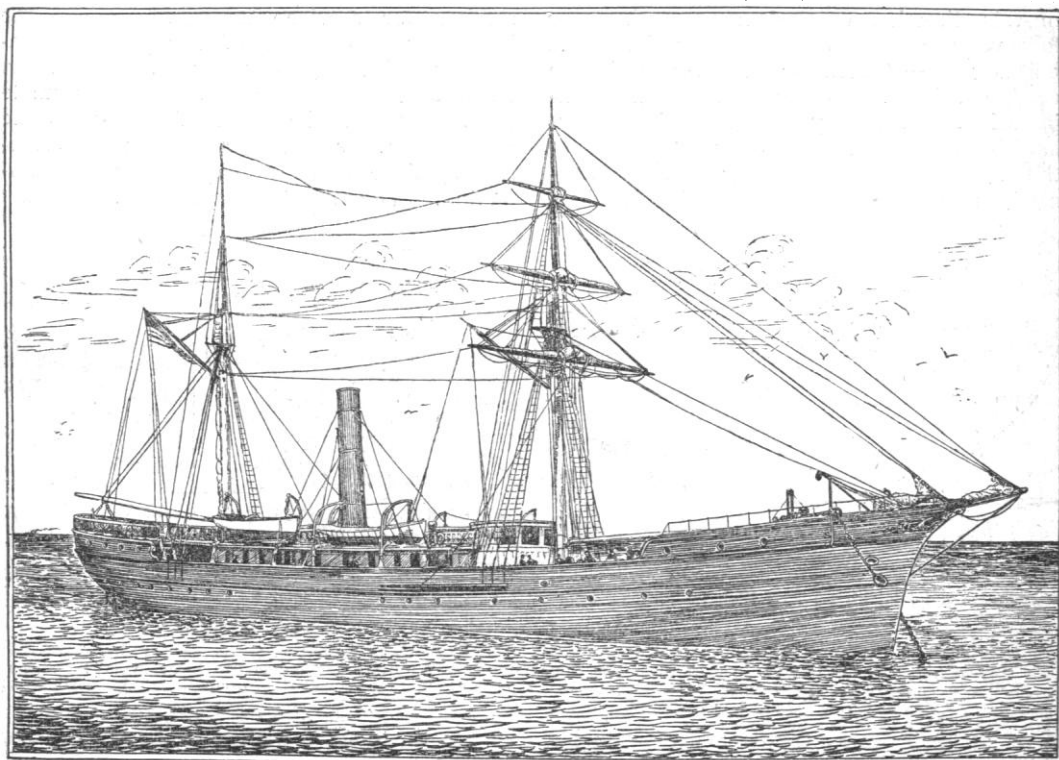
I.

PROBABLY no department of scientific investigation has made greater progress in its methods of work during the past ten years than that of deep-sea research. The successful introduction of steel piano-wire for sounding, and of wire rope for dredging purposes, marks a new era in this class of exploration, for which credit is mainly due to American skill and energy. While claiming so much in behalf of our own country, we frankly acknowledge that the only feasible method of using sound-

ing-wire was devised by one of the best known of English physicists, Sir William Thomson; but his efforts were entirely ignored by the mother government, and first bore fruit on this side of the Atlantic, through the liberality of the American navy.

It is needless in this connection to discuss the rapid development of this system of deep-sea sounding, which has been so fully described by its most zealous advocates, Messrs. Belknap

gested by Mr. Alexander Agassiz, under whose supervision it was first put to trial on the coast-survey steamer *Blake* in 1877. To Messrs. Sigsbee and Agassiz, and the officers of the *Blake*, is due the greater number of improvements in deep-sea dredges, trawls, and accessories to sounding, which are now employed on the American coast; while the U. S. fish-commission claims priority as to the appliances for moderate depths of water, although many



UNITED STATES FISH-COMMISSION STEAMER ALBATROSS.

and Sigsbee, of the United States navy. We may be pardoned, however, for recalling the fact, that it was early in 1874 that Capt. Belknap made his famous sounding-voyage across the Pacific Ocean in the U. S. *Tuscarora*, while the *Challenger* was still plodding its way around the world with its cumbersome hempen rope, one of the Thomson machines being carefully stowed below. Since then Commander Sigsbee has so perfected the sounding-machine, on the proper working of which success with wire depends, that further improvements seem impossible.

The use of wire rope for dredging was sug-

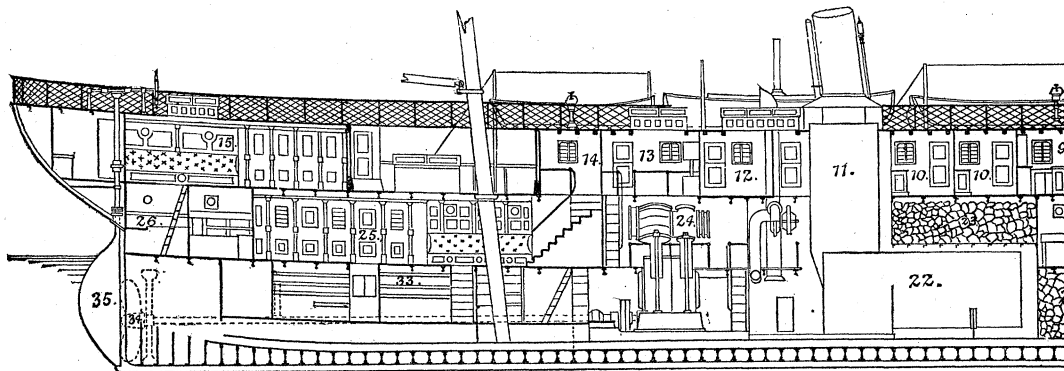
gested by Mr. Alexander Agassiz, under whose supervision it was first put to trial on the coast-survey steamer *Blake* in 1877. To Messrs. Sigsbee and Agassiz, and the officers of the *Blake*, is due the greater number of improvements in deep-sea dredges, trawls, and accessories to sounding, which are now employed on the American coast; while the U. S. fish-commission claims priority as to the appliances for moderate depths of water, although many

of these are yet to be thoroughly tested in the deeper parts of the ocean. The great desideratum in marine explorations has always been suitable vessels for properly carrying on the work in all its branches. Our coast-survey, however, is gradually building up a fleet of steamers which are admirably adapted to their special field of surveying and sounding; and several of these, among which we may name the *Blake*, the *Hassler*, and the *Bache*, have already rendered distinguished services in the line of deep-sea dredging and trawling. The latest addition to our exploring-fleet has been the construction of a

thoroughly sea-going steamer for the express purpose of investigating our maritime fisheries, in both a scientific and practical manner, by means of every known appliance suited to the work. This new undertaking is but an advance step in the progressive work of the U. S. fish-commission, under the able and judicious management of Professor Baird, and was demanded by the urgent necessity for a more extended knowledge of our off-shore fishing areas. The initiative in this direction was taken some three or four years ago, when Congress sanctioned the building of the steamer Fish Hawk, in the combined interests of fish culture and exploration. Previously, small naval steamers had been adapted to the requirements of the fish-commission as their services were needed; and, considering the pioneer char-

high seas, chasing schools of fish, or diving beneath the surface with the dredge and trawl.

The Albatross is a twin-screw propeller, rigged as a brigantine, and was built at Wilmington, Del., during 1882, by the Pusey & Jones Company, who were also the builders of the steamer Fish Hawk. She was designed by Mr. Charles W. Copeland, consulting engineer of the U. S. lighthouse board; and her entire construction and subsequent preparation for service have been under the immediate supervision of her present commander, Lieut. Commander Z. L. Tanner, U.S.N. The launch was successfully made Aug. 19; and the work of fitting up the various quarters and of arranging the scientific appliances was rapidly pushed to completion. The trial trip began Feb. 9, 1883;



LONGITUDINAL SECTION OF UNITED STATES FISH-COMMISSION STEAMER ALBATROSS.

1. Topgallant forecastle; 2. Fish-davit; 3. Sigsbee sounding-machine; 4. Dredging-engine; 5. Lower end of dredging-boom; 6. Dredge-rope; 7. Pilot-house; 8. Chart-room; 9. Upper laboratory; 10. Naturalists' staterooms; 11. Steam-drum; 12. Galley; 13. Upper engine-room; 14. Entrance to wardroom; 15. Poop-cabin; 16. Storerooms; 17. Fore-passage; 18. Berth-deck;

acter of their work, they rendered valuable aid.

In associating fish-culture with scientific investigation, some sacrifice had to be made at the expense of one or other of these projects; as no steamer, built to enter the shallow rivers and indentures of our coast-line, could venture with safety to any distance from land. Fish-breeding was at that time considered the more important; and the Fish Hawk, with her shallow draught of water, must confine her operations to the vicinity of the coast; and yet, from a perusal of recent papers in this journal by Professor Verrill, it will be seen that her contributions to biology have been surprisingly great. The Albatross, however, as the new steamer has been christened, will, like her namesake, make her home upon the

and at the time of writing she is making her first long cruise.

In the construction of the Albatross, several novel features in marine architecture have been introduced; as past experience has proved that the ordinary form of hull is but poorly suited to the work of deep-sea dredging and trawling. The most important modification is at the stern, which has been sharply modelled to enable her to back readily and safely in a seaway, her usual method of propulsion while engaged in this class of work. The rudder and its attachments have also been made of extra strength to withstand the hard service to which they are thereby subjected.

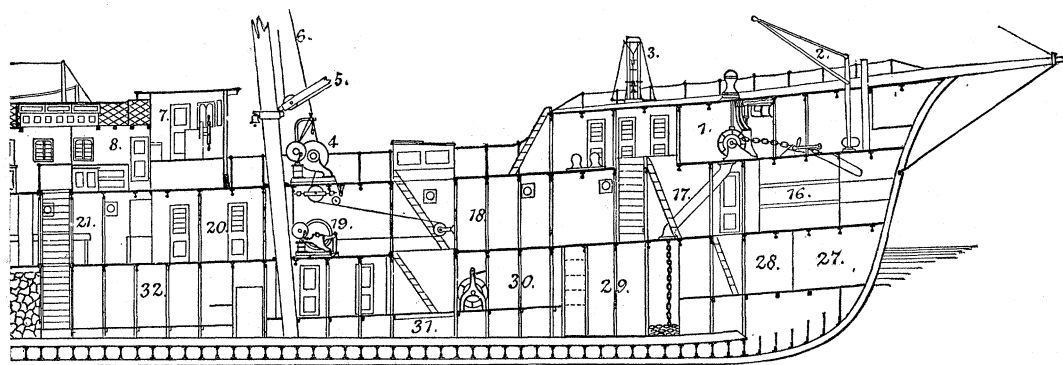
The greatest length of the vessel is two hundred and thirty-four feet; and the length at the ordinary water-line, with a draught of twelve

feet, two hundred feet. The breadth of beam moulded is twenty-seven feet and a half. The registered net tonnage is four hundred tons, and the displacement on a twelve-feet draught, a thousand tons. The frame-work and hull are of iron, which also enters largely into the construction of the deck-house. Forward and aft, the iron sides extend to the level of the upper deck to enclose the poop-cabin and top-gallant forecastle, while in the intervening space they form a high protecting rail to the main deck. The deck-house (7-14), which is eighty-three feet long, thirteen feet and a half wide, and seven feet and a quarter high, extends from just forward of the mainmast nearly to the foremast, leaving an ample passageway on either side between it and the rail. The after-part is built of iron, with wooden sheathing; but forward of the funnel it is entirely of wood.

followed by the steerage (20), main laboratory (21), engine and boiler compartments (24, 22), which extend into the hold, and the ward-room (25).

The forehold contains the magazine (27), water-tanks, ice-house (29), and a variety of storerooms. Underneath the laboratory is a large room (32) for the stowage of natural history materials; and below the ward-room are the appropriate storerooms for the use of the mess, the navigator, and paymaster.

The poop-cabin (15), on the main deck, is a large, commodious room the entire width of the ship, and extending thirty feet forward from the stern. It contains two state-rooms, a bath-room, pantry, and office, and is conveniently furnished. The ward-room (25) underneath is thirty-eight feet long, and has eight large state-rooms, a bath-room, and pantry. It is



LONGITUDINAL SECTION OF UNITED STATES FISH-COMMISSION STEAMER ALBATROSS.

19. Reeling-engine; 20. Steerage; 21. Lower or main laboratory; 22. Boiler; 23. Coal-bunkers; 24. Engines; 25. Ward-room; 26. Cabin storeroom; 27. Magazine; 28. Magazine passage; 29. Ice-box; 30. Upper hold; 31. Lower hold; 32. Natural history storeroom; 33. Wardroom storerooms; 34. Propeller-wheel; 35. Rudder.

The forward compartment, which is raised about three feet above the general level of the house, is the pilot-house (7), containing a steam quartermaster to aid in steering. Following it in succession are the chart-room (8), upper laboratory (9), four state-rooms (10), steam drum (11), galley (12), upper engine-room (13), and entrance to the ward-room stairway (14).

Below the main deck the vessel is divided into six water-tight compartments by five transverse iron bulkheads, there being also an additional bulkhead which is not closed.

The berth-deck, forward of the collision bulkhead, is cut up into storerooms (16), reached by scuttles from the main deck. Next aft is the berth-deck proper (18), which is forty feet long and the width of the ship, with superior accommodations for a large crew. It is

well lighted by a broad skylight overhead in addition to the usual side-ports. These quarters are entirely occupied by the officers of the ship, the civilian scientific staff being accommodated in the four state-rooms (10) of the deck-house abaft the upper laboratory. The latter rooms are better adapted for study than any others on the ship; each having a large, square side-window at the proper height for working with the microscope, should the naturalists desire to conduct their more delicate observations in privacy.

Of most interest to the student are the scientific quarters, which are very capacious, and amply sufficient for all possible needs. They occupy a central position, being thereby removed as far as possible from the extremes of motion caused by rolling and pitching. They extend from just above the keelson to the upper

deck, and consist of three rooms on as many levels: the lowest (32) being a storeroom; the central one (21) a general laboratory, or work-room; and the upper one (9) a deck-laboratory for microscopical work and study. These rooms communicate with one another by means of stairways, but are entirely cut off from all the rest of the ship, excepting through the side-doors of the upper laboratory. The two lower rooms are protected fore and aft by water-tight iron bulkheads, reaching to the main deck; and the storeroom, which contains the supply of alcohol, can be made a tight box, and instantly filled with steam, in case of fire.

Light is admitted to the upper laboratory through a skylight, and two windows on each side, and to the general laboratory through three ports on each side, and two deck-lights overhead; but in the storeroom artificial light is necessary. During the day-time, therefore, the working-rooms are sufficiently well lighted for all ordinary purposes; but the system of electric lamps, which pervades the entire ship, reaches its height of development in these quarters, and every few feet of space contains its little glass globe and horseshoe. The effect at night is very brilliant, and work can then go on about as comfortably as in the brightest sunshine.

[To be continued.]

SURFACE CONDITIONS ON THE OTHER PLANETS.

IN the *Popular science monthly* for June appeared an article entitled 'Cost of life,' by John Pratt, upon the habitability of the other planets. To his conclusion that most of the larger planets are probably unsuited for habitation by beings like ourselves, I think few astronomers would take exception; but several of his statements as to their surface conditions are apparently at variance with modern observation, and with the results of the application of the principles of mechanics.

As to the light from the planets, he says, "In the first place, as might have been conjectured even before the revelations of the spectroscope, from their great volume of light as compared with their distances from the sun, all of these great bodies [the four exterior planets] are self-luminous." There is some reason to believe that at certain times portions of the surface of Jupiter do shine by their own light, but it is certainly very faint, as otherwise, when his satellites pass into his shadow, they would still reflect some light to the earth. In point of fact, however, even to the most powerful telescopes, they absolutely disappear. As to the three remaining planets, their light is so faint at the best, that any determinations

as to their self-luminosity are entirely out of the question. The spectroscope shows us nothing whatever on this subject with regard to any of these bodies.

We are then told, that "the density of Jupiter being about 1.40, and that of the earth 5.48, it follows that the attraction exerted by Jupiter is roughly 300 times that of the earth. A man who weighs 150 pounds on the earth, if transported to Jupiter, would shake the ground with a ponderous tread of 45,000 pounds, or 22½ tons. His own weight would at once crush him into a mere pulp. A hickory-nut, falling from a bough, would crash through him like a minie-ball. Again: water would weigh fifteen times as much as quicksilver. A moderate wave would shiver to atoms the strongest ironclad, etc." Applying the

ordinary formula, $W = \frac{M}{D^2}$, — where M , the mass of Jupiter, in terms of the earth, is 313, and D , its diameter, is 11, — we find the weight, W , of an object on the surface of Jupiter, equals $\frac{313}{11^2}$, or 2½ times what it would weigh here: hence our 150-pound man would weigh just 375 pounds there, and would not be seriously inconvenienced by a whole battery of hickory-nuts, provided he wore his hat. With reference to Mars, he writes, that "the relative mass of Mars being only about $\frac{1}{60}$ that of the earth [it is $\frac{1}{9}$ approximately] . . . our typical man would only weigh about 2½ pounds. . . . An 80-ton locomotive would not propel a train of empty cars. . . . A rifle-ball might be caught in the hand without harm." According to the law of gravitation, the 'typical man' would weigh 66 pounds. Supposing the 80-ton locomotive reduced in weight in the proportion he states, the cars would be so also: therefore, under any such conditions whatever, the 80-ton locomotive would draw precisely as great a quantity of matter there as it would upon the surface of the earth. As to the rifle-ball, its stored energy is proportional to MV^2 ; that is, it is proportional to its mass, and independent of its weight. But the mass of a body is the same throughout the universe: therefore experiments in catching rifle-balls in the hand on the surface of Mars would be dangerous.

Finally, referring to Mars, he says, "Nothing can be more certain than that there is no liquid in Mars, and no life." As seen through the telescope, the poles of Mars appear of a brilliant white color. When one of the poles is turned towards the sun, the size of the white spot diminishes, and, when it is turned away again, it increases. Some astronomers have imagined these white spots to be snow: in that case, it is difficult to account for the disappearance, unless we suppose that it melts. It therefore seems rather a strong way of expressing it to say that "nothing can be more certain than that there is no liquid in Mars." There are several other points raised by our author which would bear mentioning, one or two on the subject of energy, particularly "a large aspect of the question, which seems to have escaped the attention of thinkers;" but I think the points referred to above will be sufficient for the present occasion.

W. H. PICKERING.

COMPOSITION OF THE MESODERM.

UNDER the title 'Archiblast and parblast,' Waldeyer has published a long article (*Arch. mikrosk. anat.*, xxii. 1), in which he reviews chiefly His's views concerning the origin of the connective tissue, blood-vessels, etc.; but he also considers several cognate questions.

His's investigations have been confined to vertebrates, but he apparently believes that his view is also applicable to invertebrates. Professor His distinguishes two distinct groups of tissues, — the archiblastic and parablatic. The former includes all the epithelial, muscular, and nervous tissues, comprising, therefore, the glands, smooth muscles, and neuroglia; the parablatic group comprises all the connective tissues and blood, with which are counted the blood and lymph vessels, and also the leucocytes. The parblast arises beyond the embryonic area proper as cells which grow into the embryonic region. These cells arise, according to His, out of the granules of the white yolk; these granules, from cells in the yolk; which cells are immigrated leucocytes, that enter the ovum while it is still in the follicle of the ovary.

Waldeyer accepts this division, but he differs from His mainly in two points, — first, in excluding the lining of the peritoneal cavity from the list of endothelia, and therefore also from the parblast; second, in ascribing a different origin to the parablatic cells. (As regards the first point, there can be no reasonable doubt that His's account of the origin of the membrane is erroneous: because, 1, the disappearance of the original epithelium, and the new formation by leucocytes of an epithelium on top of it, was, to the last degree, improbable, so that a gross error of observation would be more probable; 2, His was unable to bring forward any definite observations in his favor; 3, his conclusion was and has since been contradicted by the direct observations of others. Waldeyer has done good service in calling general attention to these objections, but the matter can hardly be considered new.)

As regards the second point, we reproduce Waldeyer's own summary (p. 47). In the eggs of all animals which have blood and connective tissue at all, the segmentation of the egg does not continue in the same manner up to the end; but one must distinguish a primary and a secondary segmentation: the first divides the egg, so far as it is capable of segmentation, into a number of cells which are mature for the formation of the tissue, and form the primary germinal layers. A remainder of immature segmentation-cells (in holoblastic eggs), or of egg-protoplasm, which has not assumed the cell-form (in meroblastic eggs), is left over. In either form, this remainder does not directly enter into the germ-layers as an integral component, but undergoes first a further cell-formation, — the secondary segmentation. From the cells thus formed, the parts richer in protoplasm are cut off, and make the primitive parblast-cells; while the part richer in yolk remains only to be used as nutritive material. It will be seen that the essence of Waldeyer's theory is, that a portion of the segmenting

egg is retarded by the presence of yolk; and so there are some cells, or, in meroblastic eggs, some protoplasm, which is laggard in development, and does not directly enter into the primitive layers, but becomes the parblast.

The parblast is essentially identical with the mesenchyma of the brothers Hertwig, except that the latter include the smooth muscles in the group. Waldeyer endeavors to justify his theory of the origin of these tissues from laggard cells, but it seems to the reporter unsuccessfully.

There is given also, p. 38-44, a discussion of the relation of the yolk to cleavage, in which the views advanced several years ago by Minot (*Proc. Bost. soc. nat. hist.*, xix.) are brought forward anew, apparently without knowledge of their previous publication by another writer. In the discussion of the origin of the parblast-cells, p. 9-27, it appears that His's view of their origin from the white yolk is definitely shown to be untenable. Incidentally, emphasis is laid upon the fact, that, in meroblastic eggs, the protoplasm of the animal pole sends down processes into the yolk: it is from these processes in the 'keimwall' of birds' eggs that the parblast-cells arise, according to Waldeyer. His article, as a whole, is chiefly a discussion of the literature of his subject. C. S. MINOT.

THE ECLIPSE OF 1882.

At the present time, when interest is chiefly drawn toward the successes of the astronomers who observed the eclipse of the sun month before last from the small islands in the Pacific Ocean, the results of the eclipse of May 17, 1882, obtained in Egypt, have especial significance. These were briefly stated by Dr. Schuster at a late meeting of the Royal astronomical society. During the progress of the eclipse three photographic instruments were at work: one took photographs of the corona itself; a second was a photographic camera with a prism placed in front of it, that is, a spectroscope without a collimator; and the third was a complete spectroscope. Photographs were obtained in all three instruments. The direct photographs of the corona indicate its variations from eclipse to eclipse, — a matter of much importance in solar physics. If the photographs taken during eclipses in the past twenty years are compared with each other, it will be seen that the corona varies in a regular way with the state of the sun's surface, although there are irregular minor changes. At the sun-spot minimum the corona is much more regular than at the maximum. At the minimum there is a large equatorial extension, and near the solar poles a series of curved rays. At the maximum there is practically no regularity at all: the long streamers go up sometimes in one direction, and sometimes in another; and this last year, near the sun-spot maximum, there was absolutely no symmetry in the appearance of the corona. The transparency of the streamers was most striking. One streamer can sometimes be traced through another, showing that the matter, whatever it is, must be very thin. The rifts start from the solar surface in an entirely

irregular way, with a tendency very often toward the tangential direction at the lower parts of the rifts. The photographs extend about a diameter and a half from the sun's limb, and a comet appears on the plates about a solar diameter and a half from the sun's centre. It must have been very bright, as it appears clearly in the photographs. Measurements seem to indicate a small shift in its position during the interval between the first photograph and the last.

Turning now to the photographs taken with the camera and prism in front, — an instrument which gives an image of the prominences as oft repeated as there are rays in the prominence, — the plates employed were sensible to the infra-red as well as violet rays. One prominence gave a great number of lines in the ultra-violet. The fact was brought out in this eclipse, that the brightest lines in the prominences are due, not to hydrogen, but to calcium. Besides these and the hydrogen lines, there is the line D_3 in the yellow, and the C line of hydrogen in the red, and also a photograph of two prominence-lines in the ultra-red. In addition to the prominences, there are visible in the photographs certain short rings round the moon, which mean that at these places the light sent out by the gaseous part surrounding the moon is not confined to the prominences. It is, as would be expected, the green coronal line which chiefly corresponds to one of those rings. This green line, K 1474, is a true coronal line, and is only very faintly traceable in one of the prominences.

In considering the results obtained with the complete spectroscope, it is a striking fact that some of the lines cross the moon's disk, and especially the two lines H and K . This proves that the calcium-lines, H and K , were so strong in the prominences that the light was scattered in our atmosphere, and reflected right in front of the moon.

The prominence-lines are very numerous: thirty such lines appear in the photograph. The hydrogen-lines are there, including those in the ultra-violet photographed by Dr. Huggins; also H and K , and other calcium-lines; and still others, chiefly unknown.

Close to the sun's limb we can only trace a continuous spectrum, a very strong one, going up to about a quarter of a solar diameter. The photographs bear out the distinction between the inner and the outer corona, the former being much stronger in light. The boundary at which this continuous spectrum ends corresponds to the extension of the inner corona. The continuous spectrum is stronger on the side where the prominences are weaker. In the corona we first of all see a very faint continuous spectrum, and in that continuous spectrum one can trace at G the reversal of the dark Fraunhofer lines. In addition, a series of faint true coronal lines can be traced in the outer regions of the corona. We have not traced any known substances in the solar corona. The greater number of the prominence-lines in the ultra-violet are also unknown, but they seem to be present in Dr. Huggins's photograph of the spectrum of α Aquilae.

LETTERS TO THE EDITOR.

. Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

The relative ages of planets, comets, and meteors.

THE theory that the sun was once a gaseous mass extending beyond the most distant planet, and that it has contracted to its present dimensions by the continuous action of gravity, and is still so contracting, is now very generally accepted by astronomers. It is well known, moreover, that the condensation of a gaseous body produces heat, and that the impact of solar matter in consequence of its motion towards the centre of gravity is one cause, at least, — perhaps the principal one, — of the sun's high temperature. The modern law of the conservation of energy affords data for determining the amount of heat produced by the condensation of the sun's mass from one volume to another. It is thus found that the contraction to its present dimensions, from a primitive volume extending indefinitely beyond the orbit of Neptune, would have kept up a uniform supply of heat equal to the present for twenty millions of years.¹ The age of the solar system, however, may be greater or less than this, as the sun's radiation may not have been constant.

In any form of the nebular hypothesis, Neptune is the oldest planet known, and the innermost of the number has had the most recent origin.

A majority of comets probably move in hyperbolas, and visit the solar system but once. Some orbits have been changed into ellipses by planetary perturbation.

For any thing we can know to the contrary, cometary matter has been falling towards the centre of our system in all ages of its existence. Whenever the perihelion distance has been less than the radius of the solar spheroid, the comet's orbital motion must have been arrested, and transformed into heat.

As the limits of geological dates are determined by the strata of the earth's crust, so the superior limits of the age of periodic comets are fixed by the planetary orbits next exterior to their perihelia. Of the comets known to be periodic, the perihelion distances of thirteen are less than the earth's distance from the sun. The ages of all these must therefore be less than that of the earth. In like manner the ages of others are shown to be less than that of Venus, while those of a few are found to be less than the age of Mercury. We may conclude, then, in general, that the ages of comets, as members of the solar system, are less than those of planets.

But as meteoroids, partly at least, are derived from comets, their origin as separate bodies in connection with our system must be still more recent: in fact, meteoric matter is being constantly detached from comets at each successive return to perihelion. The indications of this process were unmistakable in the case of the great comet of 1852, and many meteoroids of the Biela group have been separated from the comet in our own day. DANIEL KIRKWOOD.

Bloomington, Ind.

First use of wire in sounding.

Professor Verrill is quite right in supposing that I was unaware that any report of the sounding expedition of Walsh had been published. A casual reference to Walsh in the 'Depths of the sea' led me to inquire,

¹ A contraction of the radius equal to a hundred and twenty-nine feet per annum would yield the present supply of heat. See Monthly notices of the R. A. S., April, 1872.

through a naval friend, of an officer in the Navy department, unofficially, whether any report had been published. This gentleman was kind enough to make inquiries, and finally replied that he could not find out that any thing had been printed, but that the log-books were at the department. On this account I made no further search for printed data; but later, on Commander Bartlett's installation at the Hydrographic office, I mentioned it to him, and he had the goodness to search the log-books, and to send me copies of *all* references to the work with wire, contained in them, from which my note was compiled. Doubtless other note-books might have been used also. In regard to the breaking of the wire, it is specifically stated in the log-book that it parted 'owing to some of the links catching at times on others,' as the line was *paid out* in one or two cases, and in others as it was being hauled in. In another instance it parted 'owing to one of the joints catching upon another joint on the reel.' It is nowhere in the *original log* referred to the heaving of the vessel; and the last entry repeats, 'entirely owing to the short nip of the catch upon the reel.' Having had some experience in sounding in great depths of water with a small sailing-vessel, I have come to the opinion, in which I think most practised hydrographers would concur, that it is impossible that a plumb sound should be obtained from such a vessel under any circumstances likely to occur in actual work. The words quoted by Professor Verrill from Walsh's report show that the latter officer deceived himself; for it is evident, that, if the wire 'served as an anchor to keep the vessel steady,' it could not have been plumb; and, even if it appeared to be so at the surface, what it was below the surface no man could state with confidence, except that it was *not* plumb. A steamer may be kept over the wire, and, with wire properly spliced and heavily weighted, a plumb sound can be had, but not otherwise; and it may be confidently said that *accurate* sounding in deep water dates from the combination of these two factors. I may say, also, that in my note I did not, nor do I now, consider that successful trial of a sounding apparatus has been arrived at, until bottom has been reached, and the signs of it brought up.

WM. H. DALL.

Washington, June 23, 1883.

False claims.

It is to be regretted that the pages of a popular magazine of high standing should be made the vehicle of such an advertisement as appears in the *Century* for July, entitled 'Cheap food for the million,' reprinted in the publisher's department of *SCIENCE* for June 22. Of the merits or demerits of a new food-preservative, of which so many have been brought forward within the last few years, I have nothing to say: the testimony of Prof. S. W. Johnson, cited in its favor, is certainly entitled to respectful consideration. But I wish to call attention to the claim of the inventor of the new nostrum to public confidence on the ground that he is "a fellow of the Chemical society of London, and also of the Geological society, being elected after unusually severe examinations. President Huxley, of the latter society, said that 'no American should boast of an election without a severe struggle.' In evidence of this prejudice towards Americans, the fact that Professor Humiston was given two hundred and fifty questions (five times the usual number) may be cited. He is now superintendent of the company's works," etc.

It is not clear what meaning is to be attached to the words put into Huxley's mouth; but it is a well-known fact that neither in the societies named, nor

any others with which I am acquainted, is there any examination whatever required, or are any questions asked. A nomination by three members, one of whom must have personal knowledge of the candidate, and the payment of fees, are the only conditions necessary to membership of the Geological society of London, which has several hundred members upon its lists, including many Americans. In the complete catalogue of all scientific papers published in Europe and America up to 1877 (*Roy. soc. cat.*) we search in vain for the name of the 'superintendent of the company's works.' It is not creditable to the advertisers that the names of illustrious men of science and of learned societies, coupled with erroneous statements and absurd appeals to national prejudices, should be invoked, even indirectly, to recommend their wares.

T. STERRY HUNT.

Montreal, June 25, 1883.

MACLOSKIE'S ELEMENTARY BOTANY.

Elementary botany, with students' guide to the examination and description of plants. By GEORGE MACLOSKIE, D Sc, LL D., professor of natural history in the J. G. Green school of science, Princeton. N J., etc. New York, Holt, 1883. 370 p. 12°.

SCIENCE is ready to welcome a new textbook, asking only for some particular line of excellence as a warrant of its reason to be. Considering that "this volume aims to supply a readable sketch of botany," and so to treat the subject "as to meet the wants of a large class of readers who wish to know something of the fundamental principles and philosophical bearings of the science without being distracted by technicalities," we think that its readable character and the comparatively sparing use of unnecessary technical terms are among its commendable features. The style is easy, sometimes a little odd in its concatenations, as where "it is said that a monkey first introduced tea to the notice of the Chinese; the English government started its cultivation in Assam, whence the best teas now come;" and in the following paragraph it becomes even sensational.

"Their power of increasing in thickness imparts to roots their capacity for mischief. Their vigor is somewhat surprising. They make their way through dense soil, loosening it so that it becomes soft and spongy. They can split rocks, overturn walls and buildings, stop up sewers, and root up our street-pavements. They effect more injury to man's handiwork than tempest, fire, and war combined. . . . We possess a root hugging an old bottle in irredeemable captivity."

In a well-known passage at the close of one of his books, Darwin likened the tip of a root to the brain of one of the lower animals; and brains, we know, are capable of mischief, and

therefore of demoralization. Whether the root which the author is so fortunate as to possess is in dipsomaniac captivity to the bottle it hugs, or whether the bottle is captivated by the caressing root, is not quite clear from the context. And how such dire mischief to man wrought by roots — more injurious 'than tempest, fire, and war combined' — is to be reconciled with creative benevolence, we must leave for the Princeton theologians to settle, and pass on to another topic, that of judicious abstinence from technicalities.

Writers of text-books are prone to employ all the technical terms they can find, especially new-fangled ones which have not yet proved their right or reason to exist by continued usage, or which, though convenient in an original treatise or memoir, and harmless or even useful in a glossary, may be advantageously dispensed with in ordinary scientific teaching. We all know of the painter commemorated by *Punch*, who 'rubbed out a good deal,' and who claimed to 'get his best effects that way.' Many scientific books for students' use might be bettered by the same process. Professor Macloskie has so well resisted the ordinary temptation, or restrained in parenthesis needless terms which he did not like to leave out, — such as *xylem*, Greek for wood, most barbarously Germanized (as if, where a Greek said *xylon* and a Roman said *lignum*, we might not say *wood* when we meant it), — that it may be a little ungracious to complain of his making one or two himself, and making them badly. Where he says, "to avoid confusion, we shall call [the seed-coats] *exotest* and *endotest*," the inference is, that these terms are original. Nor, not to insist that confusion is rather made than avoided by the substitution of new names for well-recognized old ones, we might suggest that the coinage is in a small way pedantic, except that a pedant would not violate what our author in another place terms 'the *jus connubii*' by hybridizing Greek with Latin. Nor, if we must have such Greek-Latin crosses, would he have truncated them into *quasi* English, which is as bad as a third cross, but have written *exotesta* and *endotesta* in full, vile as the terms are. *Gametic* is certainly new coinage; and the author does not clearly say what he means it to pass for. But it may be gathered that 'gametic affinity' means relationship near enough to allow of interbreeding. We are to say, then, that species belonging to different genera have gametic affinity in the rare cases when they can be made to hybridize; and that certain species strictly of the same genus, which we have failed to hybridize, are devoid

of gametic affinity: so the term has no explanatory value whatever.

Some of the borrowed woodcuts are very good; most of the original ones are quite the reverse; and the one which is said to represent a 'tip shoot of pea' is a complete puzzle, after all the enlightenment which the letterpress affords.

Turning over the pages, we now and then come upon statements which dampen any enthusiasm of commendation which a reviewer might wish to express. On p. 16 we read that "cymose flowers are always actinomorphic, being equally exposed to light in all directions." The implication that 'actinomorphic,' i.e., regular, flowers are so because equally exposed to light from all directions is a bit of deductive botany of the Grant Allen school. And the assertion that cymose inflorescence and actinomorphic flowers always go together is by no means true, as witness all Labiatae and a large share of other didynamous flowers. The seed "in *Lepidium*, on being moistened, darts out mucilaginous threads." Is Dr. Macloskie sure of this, or does he infer that there must be such threads because they exist in various other seeds and seed-like fruits which develop mucilage when wetted? The hypocotyledonary stem "in the pea is short because the seed remains underground." Were it not better to say that the seed remains underground because this initial stem does not lengthen? On p. 82 it is asserted, or at least implied, that root-hairs last all summer long, and may be renewed on a surface that has lost them. To Grant Allen, in the year 1882, is attributed the idea that neutral ray-flowers of Compositae are sterilized members set apart and enlarged for purposes of display. Has Dr. Macloskie met with no earlier exposition of that doctrine?

Not to prolong questioning, let us say, that, for those who are most likely to use this book, it was a good idea to devote a few pages at the close to the derivation of common terms, Latin and Greek root-words, and prefixes, and to help those who do not know the Greek alphabet by writing out the words, as nearly as may be, in Roman letters.

THE GEOLOGY OF BELGIUM.

Géologie de la Belgique. Par MICHEL MOURLON. 2 vols. Bruxelles, Hayez, 1880-81. 317; 16+392 p., illustr. 8°.

THIS book, a model in its way, will be read with equal profit by the geologist and by the general reader. The geologist will find in it, critically exposed, and in a short and impartial manner, the immense amount of labor

and of detail which is scattered in the numerous papers of the Belgian geologists. Any one of ordinary intellectual culture, and interested in Belgium, will find it a clear and readable account of the past history and chief features of the country. Two causes have contributed to make easier the task of the author: the works on the geology of Belgium by d'Omalius, Dewalque, and especially the celebrated 'Esquisses géologiques' of Gosselet, have already pointed out the way to success; and, moreover, the natural disposition of the country allows a very simple grouping of facts.

Both geologically and geographically, Belgium is formed of two distinct parts. The southern half (the Ardennes) is a hilly region, a continuation of the old paleozoic nucleus of Europe, — the so-called Hercynian mountain-range; the northern half (Flandres, etc.) is a flat land or prairie region, and forms part of the great plain of northern Europe, the basin of the North Sea. The Ardennes is a paleozoic district; Flandres, a tertiary one; the triassic, Jurassic, and cretaceous formations forming but a broken belt around the paleozoic masses. All these formations are, however, studied by the author in a complete manner, and their mineralogical, paleontological, and stratigraphical characters successively described. Both their historical divisions and their local extension are given with care.

Beginning with the older rocks, we first meet the Cambrian shales, forming two principal ranges (massifs de Rocroy and de Stavelot). These rocks can be compared to the Ocoee conglomerates and shales of the Appalachian region; they contain the curious interbedded crystalline porphyroids, so well illustrated by de la Vallée Poussin and Renard, whose papers are here summarized in two good plates. The Silurian beds form two small crests extending east and west, through Brabant and Condros, and have supplied fossils of Barrande's second fauna. These beds, like the underlying Cambrian, have a southerly dip. The upper Silurian fauna is not represented.

The folding of the Silurian rocks was the initial cause of the so-called Dinant and Namur devono-carboniferous depressions, or basins. It was followed by a long-continued depression of the area, in consequence of which the accumulation of an enormous thickness of stratified rocks within the great troughs of Dinant and of Namur took place. This downward bending of the earth's crust did not go on continuously, but submitted to some irregularities related to the breaks and numerous stratigraphical divisions of the Devonian

formation. The Devonian formation of Ardennes is the most complete and best studied in Europe, through the labors of Dumont, Gosselet, Dupont, and the author. It shows a thick series of four thousand metres of alternating fossiliferous shales, sandstones, and limestones, marine for the chief part, though some beds have furnished *Psilophyton* and other plant-remains. After the period of the mountain limestone, littoral, brackish water, and finally lacustrine and terrestrial deposits, came in, and the coal continued forming.

A general movement of elevation succeeded towards the end of the coal-measures, and folded all the paleozoic sediments as if they had been crushed from south to north. This thrust had a more violent effect in the Namur than in the Dinant basin. In the former are comprised the celebrated coal-fields of Mons, Liège, and Charleroy, — the chief causes of Belgian prosperity and wealth.

At the close of the paleozoic period, the mountainous region of southern Belgium was formed; and since then it has always been exposed to denudation. South of this mountainous district, the Jura-triassic beds of eastern France now began to accumulate in the Gulf of Luxemburg (Buntersandstein and Keuper, and the Jurassic from the *Avicula contorta* beds to the middle oölites). These mesozoic seas did not penetrate north of the Ardennes, where the lower cretaceous are the most ancient mesozoic formations.

The cretaceous formations in this district possess great interest, notwithstanding their small geographical extent. The lower beds have furnished the splendid iguanodons of the Brussels museum, and the upper ones are the well-known Maestricht beds. All are chiefly littoral formations; and the so-called tourtias of the middle cretaceous are famous by the variety and richness of their faunas. In the deep and narrow Gulf of Mons, the cretaceous beds are found in a chalky condition, as in the Anglo-French basins.

In the neighborhood of Mons and Landen are found the most ancient representatives known in Europe of the tertiary epoch (*systèmes montien, heersien*), so well illustrated by Cornet and Briart. The Landenian system has a wider extension, forming, with the other terms of the eocene series, nearly all of lower Belgium. Thus it is to the wide-spread mass of the London clay, which covers the Landenian sands, that Belgium owes its meadows and well-cultivated fields, which extend in an immense plain from the Brabant to the coast,

and from Dunkirk to Ostend. The Bruxellian and Laekenian systems form superficial hills in the neighborhood of Brussels, Gand, etc. The oligocene system shows two principal divisions (tongrian, rupelian), which stretch across the lower part of the river Escaut, where it leaves the eocene districts, through which it flows in the western part of the country. The pliocene formations overlap irregularly the underlying tertiary beds, and extend from Antwerp to Louvain. Many fine fossils have been found in these beds, where Mourlon admits several divisions, — Diestien (in part), Anversien, and Scaldisien. The last chapters of the work treat of the quaternary (diluvien, hesbayen, and campinien) and recent periods.

Though special attention has here been given to the stratigraphical extent and disposition of the beds, the author has treated with equal care of their lithological and paleontological characters, their minerals and fossils, and the useful products they furnish to Belgian industry. It will be enough, to indicate what amount of documents are included in the book, to state that the lists of fossils occupy 240, and the bibliographical lists 144 pages.

DU MONCEL'S ELECTRO-MAGNETS.

Electro-magnets. The determination of the elements of their construction. By TH. DU MONCEL. From the second French edition. New York, Van Nostrand, 1883.

The same. Translated from the French by C. J. Wharton. London, Spon, 1883.

THE great interest in the practical applications of electricity demands simple treatises on the most economical methods of making electro-magnets. Count Th. Du Moncel has endeavored to supply this want, and has added another treatise to the long list he has already published upon electricity. He disclaims any endeavor to make a treatise on electro-magnets which shall embody scientific theories upon that most difficult of subjects, theoretical magnetism. His desire is to give the mechanician a *vade mecum* by means of which he can construct electro-magnets for operations outside the laboratory. Indeed, this treatise is intended to stand in the same relation to the maker of dynamo-electric machines as a treatise on the practical construction of boilers, minus theories of elasticity, would stand to the constructor of steam-engines. There is need for such a treatise, undoubtedly; for much expense can be saved by a little knowledge where to put the material to the best advantage. Most of the dynamo machines

which are before the world at the present time are defective in the arrangement of the wire of the field electro-magnets. Does the treatise of Du Moncel supply this want? The author follows the antiquated French fashion of expressing the resistance of a wire in terms of the length and diameter, without specifying, in many cases, the specific resistance. Thus, instead of ohms, we read so many metres of telegraph-wire; and one must enter into a troublesome arithmetical drudgery to ascertain what is meant. The English edition, published by Spon, states in the preface the relation between Du Moncel's units and the commonly received units of resistance and electro-motive force; but the American edition, published by Van Nostrand, leaves the reader to find out this relation after he has plodded some distance through the treatise.

The two imprints, one by Spon and the other by Van Nostrand, are carelessly edited. Thus, on p. 43 in Van Nostrand, we find an inconsistency between the values of t^2 and A .

On p. 47, Van Nostrand gives

$$\begin{aligned} ab &= \frac{\rho}{e^2} 0.000506 \sqrt[3]{\sqrt[3]{P^4 f^8}} \\ &= \frac{\rho}{e^2} \left(0.0225 \sqrt[3]{\sqrt[3]{P^2 f^4}} \right)^3, \end{aligned}$$

while Spon gives, on p. 34,

$$\begin{aligned} ab &= \frac{\rho}{e^2} \left(.0225 \sqrt[3]{\sqrt[3]{P^2 f^4}} \right)^2 \\ &= \frac{\rho}{e^2} .000506 \sqrt[3]{\sqrt[3]{P^4 f^8}}. \end{aligned}$$

We give this as an example of similar mistakes which meet the eye. The question arises whether a more carefully prepared treatise, which would start with the fundamental system of electrical measurements, is not still needed. It is useless for any one to endeavor to become a practical electrician to-day, without a sound training in mathematics as far as the principles of the differential and integral calculus. A genius may arise, but he will know enough to employ a steady plodder who has been steeped in the principles of the calculus. Most constructors who desire to build electro-magnets will find that the exigences of space and material will demand a certain form. Unless they understand the theory of magnetic measurements, they will find the treatise of Du Moncel of little value; for so many and so large approximations must be made, that the final result would not differ much from those obtained by a thumb-rule. We commend to the practical

electrician a study of the fundamental magnetic measurements rather than the perusal of treatises of this nature.

LEDGER'S SUN AND ITS PLANETS.

The sun, its planets, and their satellites. By Rev. EDMUND LEDGER, M.A. London, *Stanford*, 1882. 432 p. 12°.

OF late a considerable number of semi-popular works have appeared on astronomical subjects. They seem to meet a felt want of the community, and have been very successful. We call them *semi-popular*; because, while they are not written for professional astronomers, they are adapted, in their style and mode of treatment, less to the great masses of the business and laboring population than to the educated people who are engaged in various professional occupations. Those, for instance, who are busy in teaching, or with the practice of medicine or law, or who are pursuing geological or biological research (in short, pretty much all who would naturally subscribe for *SCIENCE*), generally wish to keep *au courant* of what is going on in other than their own special lines of work, and are delighted to find what they want, when they can get it in an attractive form.

Mr. Ledger's book is an excellent one of this class. It is less diffuse than Mr. Proctor's essays, and not quite so imaginative. It is narrower in its scope than Professor Newcomb's *Popular astronomy*, but easier reading, and fuller of detail in respect to the subjects of which it does treat. It makes no special claims to originality, but is accurate and clear, and the style is unpretentious and agreeable. The book is nicely gotten up, and very well illustrated. Altogether, we have no

hesitation in pronouncing it a volume well worth reading and possessing.

It is made up of fifteen lectures read in 1881 and 1882 in Gresham college, London. Two are upon the sun, two are devoted to the moon, two to the earth, and two to Jupiter and his satellites. Each of the other planets has a chapter to itself (counting the group of planetoids as one), and there is a chapter entitled '*Ptolemy versus Copernicus*.' Naturally, the lectures are not all of equal interest and value; but none of them are poor, or could be well dispensed with. The chapters upon Mars and the planetoids strike us as particularly good, and contain information not otherwise very easily accessible. The chapters on the sun and moon are also excellent, though naturally enough, in the main, only an abridgment and compilation from the recent books on these subjects; to which books the author handsomely acknowledges his obligations.

There are remarkably few mistakes in the work: in fact, in reading it over for this notice, we have found none at all, unless we count as such, a blunder in the illustration on p. 147, representing the comparative size of the sun as seen from Mercury at perihelion and aphelion; the difference being represented very much greater than the truth. Speaking of illustrations, the fine Woodbury-type of the eclipse of 1871 deserves special mention, and several of the pictures of Mars and Jupiter are unusually excellent. It is rather a pity that a few pages of tables were not appended, containing the numerical statistics of the planetary system. They would have greatly increased the value of the book for those who wish not merely to read it once, but to keep it on their shelves for occasional reference.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

ASTRONOMY.

Flexure of the broken transit.—Professor C. A. Young, after alluding to the fact that the flexure-correction of this peculiar form of transit is not treated of in any of the common text-books on practical astronomy (not even in Sawitsch, who specially describes and discusses the instrument itself), states the theory of the correction to transits of stars observed with the 'broken transit,' which is often so great as to amount to a large fraction of a second of time at the zenith. The constant of flexure must be known, and its effect eliminated, before the collimation error can be determined by reversal of the instrument on a circumpolar star. The correction has the same co-

efficient with the level-error; and denoting this latter, as usually obtained, by b , the flexure-constant by f , and the pivot-correction by p , the complete formula for the 'level-constant' is $[b \pm (f \pm p)]$. Thus, by flexure, the time of transit of a star is affected by $f \cos z \sec d$. The sign of f changes with the reversal of the instrument, being always plus for eye east, and minus for eye west. Prof. Young gives several methods of determining f : by observing zenith stars in reversed positions of the instrument, by means of the collimating eye-piece and mercury-basin, or a vertical collimator supported above the instrument, and by least-square treatment of equations given by repeated observation of suit-

able stars in both positions of the instrument. Some forms of the 'broken telescope' transit, especially those with a slender axis, require the addition of terms involving other functions of z than its cosine. Prof. Watson found for a Stackpole transit a flexure-correction of the form $(f \cos z + f' \cos^2 z) \sec d$. But if the axis is reasonably stiff, the second term is never sensible. — (*Sid. mess.*, June.) D. P. T. [1]

MATHEMATICS.

Double theta-functions. — M. Caspary gives an account of some of the more elementary theorems concerning the theta-functions of two variables. He proves first, in a very simple manner, that the squared functions can be arranged in the form of a determinant of the fourth order which satisfies all the conditions of a determinant of an orthogonal substitution. He derives also the Göpel relations between these functions and their application to Kummer's surface. A number of other fundamental theorems are also arrived at in a very elementary manner, making the paper a valuable introduction to the study of the double theta-functions. — (*Journ. reine ang. math.*, xciv. no. 1.) T. C. [2]

Periodic functions. — M. Hurwitz discusses single-valued $2n$ -fold periodic functions which throughout a finite region have the character of rational functions, and which are real for real values of their arguments. More exactly he examines the properties of the periods of such Abelian integrals as belong to a real algebraic form (*gebilde*). By a real algebraic form he means the aggregate of all pairs of values of (x, y) which satisfy an irreducible algebraic equation $(F(x, y) = 0)$ whose coefficients are all real. Defining a periodic function by the equation $\phi(u_1 + P_1, u_2 + P_2 \dots u_n + P_n) = \phi(u_1, u_2 \dots u_n)$, the complex of quantities P_a is called a period of the function ϕ , a single one of these quantities being called a modulus of periodicity. A period is then real or pure imaginary when the moduli of periodicity which constitute it are real or pure imaginary. The principal theorem arrived at by the author is as follows: let $\phi(u_1, u_2 \dots u_n)$ denote a single-valued $2n$ -fold periodic function which everywhere throughout a finite region possesses the character of a rational function, and which takes real values whenever its arguments are real; then there are always n period-pairs, $(P_{1\beta}, P_{2\beta} \dots P_{n\beta})$, $(P_{1, n+\beta}, P_{2, n+\beta} \dots P_{n, n+\beta})$, which form together a system of primitive periods of the function, and which are of such a nature, that, for each pair, one of the two conditions following is satisfied: either the first period $(P_{1\beta} \dots P_{n\beta})$ is real, and the second period $(P_{1, n+\beta} \dots P_{n, n+\beta})$ is purely imaginary; or the first period is real, and the period $(2P_{1, n+\beta} - P_{1, \beta} \dots 2P_{n, n+\beta} - P_{n\beta})$ is purely imaginary. — (*Journ. reine ang. math.*, xciv. no. 1.) T. C. [3]

PHYSICS.

Liquefaction of nitrogen and carbonic oxide. — S. Wroblewsky and K. Olszewski give a more detailed account of the liquefaction of nitrogen (*SCIENCE*, i. 970). The gas remained invisible when

submitted to a pressure of one hundred and fifty atmospheres and a temperature of -136° ; but, when the pressure was slowly reduced to fifty atmospheres, the gas was liquefied, presenting a visible meniscus, and evaporating very rapidly. Under the same conditions, the authors succeeded in liquefying carbonic oxide, which formed a colorless liquid with a visible meniscus. — (*Comptes rendus*, xcvi. 1225.) C. F. M. [4]

Optics.

Mirage. — In an article entitled "State of the atmosphere which produces the forms of mirage observed by Vince and by Scoresby," Prof. Tait presents some very interesting researches regarding these particular forms of mirage. After an historical note, in which he refers to two valuable contributions to the subject by Wallaston and by Biot, which go far toward a solution of the problem, but have unfortunately fallen into oblivion, he presents his own investigations. His method consists in treating the curvature of a ray of light in the same way as the motion of a projectile; the two cases corresponding when, in the case of mirage, the square of the index of refraction of the air is proportional to the distance from a given horizontal plane.

He finds, however, that, "whatever be the law of refractive index of the air (provided it be the same at the same elevation), all we have to do to find the various possible images of an object at the same level as the eye is to draw the curve of vertices for all rays passing through the eye in the vertical plane containing the eye and the object, and find its intersection with the vertical line midway between the eye and the object." By making suitable suppositions regarding the change of density, he finds that "the conditions requisite for the production of Vince's phenomenon are a stratum in which the refractive index diminishes upwards to a nearly stationary state, and below it a stratum in which the upward diminution is either less, or vanishes altogether." It will be seen that the solution of the problem of atmospheric density and refraction by this means is entirely indeterminate. The supposition of Prof. Tait satisfies the conditions presented by the observations of Vince; but that it is the only law or the true law must be verified by investigations of a different nature.

The method is especially valuable in its inverse form as affording a test of supposed laws of density and refraction in their ability to furnish the various phenomena of mirage. — (*Nature*, May 24.) G. E. C. [5]

(Photography.)

Concentrated developer in one solution. — Where the photographer intends to travel, and develop on the route, it is very desirable to reduce his chemical outfit to the smallest bulk and to the fewest liquids possible. Mr. G. Cramer, the dry-plate manufacturer, gives the following formula for a developer, which he considers gives the best of results, and at the same time has the advantage of extreme portability.

Stock solution.

Sulphite of soda (crystals) 3 ounces.
Bromide of ammonium $\frac{1}{2}$ ounce.

Bromide of potassium $1\frac{1}{2}$ ounces.
 Pyrogallie acid 2 ounces.
 Dissolve in distilled water 32 ounces.
 Add sulphuric acid (c. p.) 120 minims.
 Add aqua ammonia (strongest) 3 ounces.
 Add water to make up bulk to 40 ounces.

The sulphuric acid and aqua ammonia should be measured very exactly. Instead of three ounces of crystals, two ounces of granular sulphite of soda may be substituted to produce the same effect. Dilute a sufficient quantity for one day's use as follows: for ordinary purposes, one part in eleven; for very short exposures, one part in three to six; for over-exposed plates, or in all cases where great intensity and contrast are desirable, one part in twenty. This developer may be used repeatedly if it is always returned immediately to the pouring-bottle, which should be provided with a tight-fitting rubber stopper. As long as the solution remains transparent, it is good; but when it looks muddy its use should be discontinued. — (*Philad. phot.*, June.) W. H. P. [6]

ENGINEERING.

Mill-engines.—The Southwark iron foundry has constructed for Messrs. Cheney Brothers of South Manchester, Conn., a compound 'Porter-Allen' engine, having steam-cylinders 12 and 21 inches diameter, 2-feet stroke, to run at 180 revolutions per minute. The power is given at 200 horse-power. The ratio of expansion is 16. The expenditure of water was 18.5 pounds per horse-power and per hour. Of this, 11.75 was accounted for by the indicator: the rest was wasted by condensation in the steam-cylinders and by leakage. In these engines the low-pressure cylinder is steam-jacketed, and the exhaust from the high-pressure cylinder passes into an intermediate reservoir, from which the large cylinder is supplied. The reservoir acts as a separator for the water carried in with the steam; and this water is trapped off, and does not reach the low-pressure cylinder. — (*Mechanics*, May 19.) R. H. T. [7]

Compressed steel.—Tests have been made at the Watertown arsenal on cold-worked steel made by Naylor & Co. at the Norway steel and iron works, Boston, Mass. The elastic limit is raised from 26,540 pounds per square inch (1,966 kgs. per sq. cm.), in the hot-rolled bar, to 61,000 pounds (4,288 kgs.) in the cold-rolled steel. The ultimate strength is increased from 55,400 pounds (3,895 kgs.) to 70,420 (5,140 kgs.), in one case, and to 81,890 (5,757 kgs.) in another. The results of tests made at the mechanical laboratory of the department of engineering of the Stevens institute of technology are given, showing the increase due to cold rolling to be 70 per cent of the original torsional strength with iron, and over 150 per cent with soft steel. The resilience, or shock-resisting power, was increased, in an average of three tests, nearly 300 per cent in iron, and to double the latter quantity in steel. — (*Ibid.*) R. H. T. [8]

Time-fuze for artillery.—Col. Richardson, R. A., finds that all the forms of time-fuzes at present in use are unsatisfactory, since they depend for their

accuracy on the length of time during which a given column of composition burns; and this is a matter which is difficult of control at the best. He proposes to take advantage of the rapid and regular rotation of the shell during its flight by which to work a mechanism, which shall liberate a concussion-fuze at any desired moment. — (*Proc. roy. artill. inst.*, April, 1883.) C. E. M. [9]

CHEMISTRY.

(General, physical, and inorganic.)

Basic sulphates of copper.—By continued boiling of a solution of cupric sulphate, S. U. Pickering obtained a basic sulphate, to which he assigns the formula $6\text{CuO} \cdot 2\text{SO}_3 \cdot 5\text{H}_2\text{O}$. Precipitation in the cold with potassic hydrate gave the basic salt $4\text{CuO} \cdot \text{SO}_3$. — (*Chem. news*, xlvii. 181.) C. F. M. [10]

The hydrates of chlorine.—E. Maumenè thinks that the hydrate $\text{Cl} \cdot 10\text{H}_2\text{O}$, mentioned by Faraday, does not exist. Maumenè observed the formation of the hydrate $\text{Cl} \cdot 4\text{H}_2\text{O}$, which crystallized in cubes, and of the hydrate $\text{Cl} \cdot 7\text{H}_2\text{O}$ in well-marked crystals. With an excess of water, the hydrate $\text{Cl} \cdot 4\text{H}_2\text{O}$ is converted into the form $\text{Cl} \cdot 12\text{H}_2\text{O}$, which forms orthorhombic crystals. — (*Bull. soc. chim.*, xxxix. 397.) C. F. M. [11]

Ammoniacal bromides and oxy-bromides of zinc.—When zinc oxide is dissolved with the aid of heat in a solution of ammoniac bromide, G. André states that the compound $3\text{ZnBr}_2 \cdot 3\text{NH}_3 \cdot \text{H}_2\text{O}$ is formed. This compound is completely decomposed when boiled with a large quantity of water, leaving only the oxide. The compound $3\text{ZnBr}_2 \cdot 4\text{NH}_3 \cdot \text{H}_2\text{O}$ is formed when the experiment is conducted in the cold. On passing dry ammonia gas into a solution of zinc bromide, it is absorbed, with the formation of the product $3\text{ZnBr}_2 \cdot 5\text{NH}_3 \cdot \text{H}_2\text{O}$. The compound $2\text{ZnBr}_2 \cdot 5\text{NH}_3$ results when the ammoniacal bromide $2\text{ZnBr}_2 \cdot 5\text{NH}_3 \cdot 2\text{H}_2\text{O}$ is heated. The following oxy-bromides were prepared by methods similar to those which give the oxy-chlorides: $\text{ZnBr}_2 \cdot 4\text{ZnO} \cdot 13\text{H}_2\text{O}$, $\text{ZnBr}_2 \cdot 4\text{ZnO} \cdot 19\text{H}_2\text{O}$, $\text{ZnBr}_2 \cdot 5\text{ZnO} \cdot 6\text{H}_2\text{O}$, $\text{ZnBr}_2 \cdot 6\text{ZnO} \cdot 35\text{H}_2\text{O}$. — (*Bull. soc. chim.*, xxxix. 398.) C. F. M. [12]

Artificial hausmannite.—By heating manganous chloride to the point of fusion for several hours, A. Gorgen obtained crystals, on cooling, which possessed all the properties of the mineral hausmannite. — (*Comptes rendus*, xevi. 1144.) C. F. M. [13]

Formation of sulphides by pressure.—W. Spring submitted finely divided magnesium with the amount of sulphur calculated for one atom to a pressure of sixty-five hundred atmospheres. The product proved to be a homogeneous mass which gave off hydric sulphide when heated with water to 50° or 60° . Zinc sulphide was formed by subjecting a mixture of zinc and sulphur to the same pressure. Iron united with sulphur, forming, probably, a polysulphide. Cadmium gave a yellow powder, from which hydrochloric acid liberated hydric sulphide. Sulphides of aluminum, bismuth, lead, silver, copper,

tin, and antimony were obtained by this process. — (*Berichte deutsch. chem. gesellsch.*, xvi. 999.) C. F. M. [14]

(Analytical.)

Determination of nitrogen. — A new method for determining nitrogen, applicable to all nitrogen compounds, is proposed by H. Grouven. It consists essentially in burning the substance at a bright-red heat in a current of superheated steam. He first applied the process on the large scale to the production of ammonium salts from peat, but has since perfected it as an analytical method. The substance is burned in a boat, and the vapors arising from it are passed over a glowing layer of small fragments of a preparation called by the author 'contact-mass', and then through standard acid, as in the soda-lime method. The contact-mass consists of an ignited mixture of peat, chalk, and cement clay in certain proportions, and must be renewed after about fifty combustions. The advantages claimed for the method are, that combustions may succeed each other rapidly in the same apparatus (constructed of iron, with asbestos stoppers), that large quantities of material (two to three grams) may be used, that no drying or pulverization is necessary, and that it may be combined with an ash determination. Nitrates are dissolved with addition of sugar, sufficient clay is added to make a stiff dough, and the latter is introduced into the apparatus. The method is said to give concordant results, which are slightly higher than those obtained by the soda-lime method. — (*Landw. vers.-stat.*, xxviii. 343.) H. P. A. [15]

AGRICULTURE.

Chemistry of 'fairy-rings.' — The formation on pasture-land of so-called 'fairy-rings,' that is, of circles of dark-green grass more luxuriant than the surrounding herbage, has long been supposed to be connected with the growth and decay of fungi, which serve as manure for the grasses which succeed them. The effect has by some been ascribed chiefly to the ash of the fungi, while others attribute it largely to their nitrogen. Two views are possible in regard to the way in which the fungi enrich the soil. They may have the power of attacking those organic and mineral matters in the soil which are not available as food for higher plants, and so of converting them into an available form, or it is possible that they have the power to assimilate free nitrogen from the air, and thus increase the store of this element in the soil. Lawes, Gilbert, and Warington have endeavored to decide between these alternatives by analyzing samples of soil from within, on, and outside of, several such rings. Almost uniformly the percentage of nitrogen in the surface-soil to the depth of nine inches was greatest outside the ring, least within it, and intermediate on the ring. The results of the carbon determinations were similar, but less uniform. The authors conclude that the fungi simply render more available to vegetation materials already existing in the soil; and that, as these materials are taken up and removed in the more abundant growth which follows, the soil is naturally impoverished. This conclusion applies, in the first place, to

the nitrogen; but it would seem that it must be equally true of the ash ingredients. Whether there may not also be an evolution of free nitrogen by the fungi, or whether, on the other hand, nitrogen may not be assimilated from the air, are undetermined questions; but the phenomena are explainable without these suppositions. — (*Journ. chem. soc.*, ccxvi. 208.) H. P. A. [16]

GEOLOGY.

Puerco beds in France. — Professor E. D. Cope referred to an analysis by Dr. Lemoine of the marsupial types belonging to the *faune cernaystienne* as having been made considerably later than the speaker's diagnosis of similar forms from the Puerco beds, which belong to the same geological horizon. He claimed, that, as the age of the American formation had been the first to be definitely determined, its name should be applied to the corresponding French deposits. — (*Acad. nat. sc. Philad.*; meeting June 12.) [17]

The Allegheny oil-sands. — Mr. C. A. Ashburner stated that he had recently examined the Allegheny oil-fields of western New York, and had been able to determine one or two points of interest both to commerce and to geology. After defining the Bradford and Allegheny oil-fields, the varying horizons of the oil-supply were alluded to. He had determined that the Allegheny oil-sands of New York were not above the Bradford sands of Pennsylvania, but were the same. Investigations extended into Livingston, Steuben, and Wyoming counties, N.Y., established the belief that the sands alluded to belong to the lower Chemung group. Mr. Ashburner further remarked, that, while these sands are doubtless for the most part reservoirs of oil produced in lower strata, some of the material was formed from plants contained in the sands themselves. The oil in Pennsylvania never reaches the reservoirs from above.

Mr. Benjamin S. Lyman stated his belief that the oil always originates in the sand where it is found. — (*Acad. nat. sc.*; meeting June 12.) [18]

GEOGRAPHY.

(Arctic.)

Northern notes, Atlantic region. — The Germania sailed from Hamburg, June 20, with provisions and instruments for the German expedition at Cumberland Inlet. — The departure of the Willem Barents in search of the Dutch expedition on the Varna took place as proposed. — The account recently published of the wintering at Cape Flora, Franz Josef Land, by the Eira party, contains numerous items of interest in connection with the proposed use of this land as a starting-point or base for more northerly expeditions. As might be expected from the insularity of the land, the winter is milder than in the same latitude on the west Greenland coast. The land is probably slowly rising, like most other arctic land. Terraces ninety feet above the sea-level were observed. Resident land-animals, such as reindeer, arctic hares or rabbits, and ptarmigan, there are none. Of wandering arctic animals who live in the sea or on the ice, and are common to the whole frozen re-

gion, and sea-birds, there is a certain supply, the former being present the year round, though only male bears occur in winter, and the small auks for two-thirds of the year. The lowest temperature observed was forty-three degrees below zero, Fahrenheit, and this in latitude 80°. — Tromholt, whose researches into the aurora borealis have proved its connection with electrical discharges from the earth, proposes to spend the winter 1883-84 in Iceland, devoting himself to similar studies with Lemström's apparatus, and on the lines indicated by him. — The U. S. S. Yantic sailed June 14, from New York, to join the Proteus at St. Johns. Ensign H. G. Dresel, U. S. N., accompanies the Yantic as naturalist. Later advices announce the departure of both vessels from St. Johns for Lady Franklin Bay, June 29. — The Danish South Greenland expedition has arrived at its field of work, and at last accounts expected to begin operations immediately. — W. H. D. [19]

Northern notes, Pacific region. — June 2, the steamship Dakota left San Francisco for an excursion throughout south-eastern Alaska with a large number of excursionists. Similar excursions are planned for July and August. — The schooner Leo has sailed from San Francisco to Point Barrow, to relieve Lieut. Ray and his party, and to obtain absolute magnetic astronomical and pendulum observations at the station. Returning, Mr. Clarke of the signal-service will relieve the present officer at St. Michaels, Norton Sound, and take charge of the station, which will be the most northern signal-service station then in operation. — A vessel for the hydrographic exploration of the waters of Alaska, under the auspices of the U. S. coast-survey, is about to be constructed on the Atlantic coast, and sent out *via* Cape Horn, it being found that the expense of building her on the Pacific coast would considerably exceed the funds available. — The last reports from the mines near Juneau, Alaska, are very favorable: the owners of one mine 'cleaned up' \$9,000 in April; \$80,000 have been refused by the owners of another claim. A number of miners will have preceded Lieut. Schwatka on his journey down the Lewis and Yukon rivers this season, bound to join the Schreffelin party on the Tananah. If these numerous prospectors and adventurers were to record their observations, doubtless much valuable information on other than mining topics might be preserved. — The rock upon which the steamer Eureka was lost last month proves to be a previously unknown danger. — The decrease of salmon in the rivers of Oregon and elsewhere has led to much activity in pushing out into the new north-west in search of unpillaged streams. A great many new salmon-fisheries have been established at various points in British Columbia and Alaska. — The U. S. S. Adams is to visit the island of Kadiak on her summer cruise. — The authorities of British Columbia have instituted an exploration of the Queen Charlotte Islands with reference to agricultural lands. The north-eastern portion of the northern island has been noted for nearly a century for its attractive aspect. The Hudson Bay company has long had a station at the entrance

of Massett Inlet (named Hancock River by Capt. Crowell of Boston in 1791), where potatoes and other vegetables flourish; and the fat and sleek appearance of the cattle has been often mentioned by more recent visitors. The western coast of these islands has hardly been visited by explorers since Ingraham, in 1791, made his sketch-map of the coast. It is high and mountainous as far as known, and, like the south-eastern part of the group, likely to be chiefly valuable for its timber, minerals, and fish. — The body of a white man murdered by the British Indians has been found near Milbank Sound, concealed near the shore; while two Alaskan Indians, who enlivened a visit to British Columbia by slaying two Chinamen, have been sentenced to be hanged at Victoria, V.I. — The steamer Pinta of the U. S. navy, which was prepared for police-duty and exploration on the Alaskan coast, and lately pronounced unseaworthy, has been re-examined, and the decision reversed: she will sail shortly *via* Cape Horn under the command of Lieut. Uriel Sebree, U. S. N. This voyage will offer excellent opportunities for scientific observations *en route*. — The U. S. S. Corwin, under the command of Capt. Healy, has sailed under instructions to visit Juneau, and settle certain quarrels between American and British miners there, then to proceed to the Pribiloff Islands to protect the seal-fisheries; after which St. Lawrence Bay, Bering Strait, will be visited, and the presents from the government to those hospitable Chukchis who preserved the lives of the Rodgers party will be delivered, arctic whiskey-smugglers looked after, and the usual observations made. — W. H. D. [20]

BOTANY.

Cryptogams.

Notes on Laminariæ. — In the fourth part of his *Observationes phycologicae*, Prof. J. E. Areschoug gives a revision of some species of Laminaria and related genera, including several of the forms found in the United States. He considers that *L. platymeris*, De la Pyl., is the same as *L. Cloustoni*, which he places in the genus *Hafgygia*, to which he considers that *L. Andersonii* also belongs. — W. G. F. [21]

Iowa fungi. — Professor J. C. Arthur gives very full descriptions of twelve species of Iowa Uromyces, including one new species, *U. acuminatus*, on *Spartina*. At the end is an index of synonyms and host-plants. — (*Bull. Minn. acad.*, ii.) W. G. F. [22]

Injurious Algae. — In a paper on some Algae of Minnesota supposed to be poisonous, Prof. J. C. Arthur gives an account of a species of *Rivularia* infesting the water of ponds at Waterville, Minn., and supposed to be the cause of death or injury to cattle. He also describes the condition of Lake Phalen, near St. Paul, in which he found several species of Nostochaceae. — (*Bull. Minn. acad.*, ii.) W. G. F. [23]

Ohio fungi. — In a continuation of his paper on the mycologic flora of the Miami valley, Mr. A. P. Morgan gives a description of the *Hyporhodii*, *Dermi*, *Pratelli*, and *Coprinarii* of the region mentioned, including sixty-five species. — W. G. F. [24]

Phenogams.

Formation of cystoliths.—Chareyre has examined the development of these bodies with special reference to the source of the materials from which they are produced. He finds that the food-reserve in seeds of Urticaceae is composed of aleuron grains possessing 'globoids;' and yet the calcareous matter forming the globoids, though disappearing at the period of germination, does not contribute to the formation of the cystoliths. Sometimes, when grown upon pure sand, the seedlings exhibit the *pedicle* of the cystolith, but nothing more. Upon chalky soil, or even ordinary earth, the cystoliths appear very soon,—in fact, as soon as the cotyledons are disengaged from the seed-coats. If the seeds are made to germinate in darkness, even if other conditions are favorable, the cystoliths remain in the rudimentary state. Furthermore, in some cases, cystoliths already formed disappear upon keeping the plants in darkness. — (*Comptes rendus*, May 28.) G. L. G. [25]

ZOOLOGY.

Coelenterates.

A new hydroid polyp.—Professor E. D. Cope described an interesting form of hydroid polyp found in large numbers on the bark of submerged trees in Upper Klamath Lake, Oregon. Its coenoeium is a mass of creeping yellowish stems embedded in sarcode. Each zoöid is of an elongate oval form, sessile, and with six rays of equal size, each one-half as long as the body. The zoöids are translucent, but with two oval bodies in the lower half of the body-cavity of a yellow color. These are collected in masses as large as the fist. The length of each zoöid is one millimetre. They did not extend themselves beyond this length, neither did the rays elongate to beyond half the same during the time they were observed. They retracted themselves on being irritated. They do not possess any fringes like the arms of the polyzoa. As the possession of a coenoeium distinguishes this genus from all the fresh-water hydroids, it was proposed to distinguish it as the type of a new genus with the name *Rhizohydra*, the species being named *flavitincta*. An attempt to preserve some of the masses of zoöids in alcohol was not successful. — (*Acad. nat. sc. Philad.*; *meeting* June 19.) [26]

Mollusks.

Abyssal mollusks.—The fifth part of the Mollusca of the Lightning and Porcupine expeditions, by Dr. J. Gwyn Jeffreys, has been received. It treats of the Solenoconchia, Polyplacophora, Docoglossa, and scutibranchiate limpets, contains supplementary notes to the preceding four parts, and is illustrated by two excellent plates. The number of species first described herein is not large; but a surprising number of facts as to distribution, synonymy, biography, and external anatomy, are brought together. In adopting a later name than *Acmaea* for that genus, he observes that in the original description no type or species was mentioned by Eschscholtz, but has apparently overlooked the fact that the same is true of the genus *Tectura*, by which he would replace

Acmaea. — Parts xv. and xvi. of the preliminary descriptions of the Mollusca of the Challenger expedition, by Rev. R. Boog-Watson, are at hand. They cover the Ranellidae, Muricidae, Scalaridae, and Solariidae in the first, and the Fissurellidae and Cocculinidae in the second part. Quite a number of the species are from comparatively shallow water. Eight new species of *Puncturella* were obtained from one dredging at a locality north of Culebra Island, near St. Thomas, in the Danish West Indies. One of these is the largest yet known. The common *Puncturella noachina* Linn. of British, north-east American, and Alaskan seas was obtained in the Straits of Magellan, at Kerguelen Island, and at a station between these two, which seems truly remarkable. The operculum of *Nassaria kampyla* Watson, and the dentition of a new species of *Cocculina* from the Philippine Islands, are figured. The teeth closely resemble in general features those of the American species, except that the median tooth is more, and the major laterals less, developed than in the forms obtained by the U. S. fish-commission. The descriptions are in the full and faithful manner characteristic of Mr. Watson's work. — W. H. D. [27]

Crustaceans.

Haemoglobin in the blood of Branchiopoda.—Some years ago E. Van Beneden discovered a double system of circulation in some of the parasitic Copepoda like that in many annelids, and described a complicated system of vessels with true walls, filled with a red fluid containing haemoglobin, but no corpuscles, and entirely distinct from the lacunar system with colorless fluid containing corpuscles. P. Regnard and R. Blanchard find a similar system in *Apus*, and believe that it exists also in some Cladocera and Ostracoda. Chemical examination convinces them that true haemoglobin is present in the blood of *Apus*, is always combined with oxygen, and plays some part in respiration. — (*Zool. anz.*, May 7, 1883.) S. I. S. [28]

Fresh-water Copepoda.—F. W. Cragin enumerates the genera of free-swimming Copepoda known to inhabit inland waters, describes and figures ten species of Cyclops, half of them new, from Cambridge, Mass., and publishes a translation of descriptions in Russia of several species of Cyclops by Poggenpol. Mr. Cragin notes the occurrence of the gregarinian, *Lagenella nobilis*, in North American species of Cyclops. — (*Trans. Kansas acad. sc.*, viii. 1883.) S. I. S. [29]

Insects.

The male genital armature of Lepidoptera.—Considering how important a use has been made of these organs to distinguish species in nearly all other groups of insects, it is a little surprising to see how few lepidopterists have availed themselves of the excellent marks of distinction they afford. Rambur in 1839 (whose writings Gosse in the paper before us entirely overlooks), de Haan in 1842, and recently Buchanan White, are the only European authors who have paid any attention to these organs in butterflies; and Scudder and Burgess stand alone in this country.

In the present paper, Gosse describes and figures their appearance in eleven species of Ornithoptera, and fifty-six species of Papilio, including our own *Thoas* and *Turnus*. In one, *P. Schmeltzi*, he found a slight asymmetry in the armature of the two classes. Gosse gives new names to nearly all the parts. The side-plates, or flaps, which conceal the whole, he terms, as usual, 'valves;' the inwardly projecting armature of the interior of these, the 'harpes;' the beak-like mesial prolongation of the eighth abdominal segment, the 'uncus;' the unpaired appendage lying between it and the intromittent organ, the 'scaphium.' He has done particular service in the care with which he has reproduced the scaphium, — an organ consisting, in the swallow-tails, of chitinous points on a membranous body, and therefore badly distorted in dried specimens. This portion was studied and drawn after it had been made to assume its natural fresh appearance by absorbing a drop of water. The variety and strangeness of form and armature assumed by these parts, and particularly by the so-called scaphium and harpes, is very remarkable. In his naming of these parts anew, Gosse has burdened us with new terms for organs which are abundantly named already; but they will, perhaps, have their advantages, if they do not survive after homologues in other insects are pointed out. In his remarks on these organs in other butterflies, Gosse fails to see the homologues which exist, and which Burgess points out in part in a paper which Gosse appears not to have seen (*Anniv. mem. Bost. soc. nat. hist.*), and Buchanan White as well (*Trans. Linn. soc., Zool.*, i. 358). In brief, it may be stated that the organs in butterflies consist, besides the intromittent organ, of simply an unpaired upper organ, and paired lower appendages; both of which are attached, the upper immovably, to the ninth abdominal segment. The upper organ usually takes the form of a hook, and the lower, of claspers. In the Papilionides, however (including in that both swallow-tails and pierids), the dorsum of the eighth segment of the abdomen is prolonged posteriorly into a terminal hook overlying and concealing the true upper appendage, and at first readily mistaken for it, as shown in the swallow-tails by White and in the pierids by Burgess. Burgess also shows that false claspers exist in Danaids, differing only from true claspers in not being articulated. Bearing in mind the attachment of the different external organs ancillary to generation, their homologues throughout the insects are not difficult to trace.

Buchanan White termed the 'upper organ' of Scudder and Burgess the 'tegumen,' and their 'claspers,' 'harpagones.' The uncus of Gosse (which on rare occasions is wanting in some swallow-tails) is therefore no proper part of the ordinary organs ancillary to generation, but a prolongation of the eighth abdominal segment. The scaphium is the upper organ, or the tegumen, of White; the valves of Gosse, the claspers of Scudder and Burgess or the harpagones of White; and the harpe, merely the armature of the clasp, which is extremely varied and complex, not only in the group where Gosse has so well illustrated it, but also in many skippers: indeed, this bizarre form

of armature, both of 'scaphium' and 'harpe,' is a new indication of the alliance between the swallow-tails and skippers. We may further remark, that, if the old genus *Papilio* is the sooner broken up by the additional help afforded by these new studies, Gosse will have done systematists a real service. — (*Trans. Linn. soc. Lond., Zool.*, ii. 265.) S. H. S. [30]

VERTEBRATES.

Chemistry and physiology of blood-serum. — In dogs which have been starved for a period of five or six days, and which previous to the commencement of the starvation had been fed for two or three weeks on horse-flesh freed as far as possible from fat, Burckhardt finds a diminution in the total amount of proteids in the blood-serum, the loss varying from 4% to 16% of the original amount of proteids present. Of the two proteids of serum, the quantity of serum-globulin increases during starvation, the increase ranging in his experiments from 22.8% to 66.4% of the quantity present before starvation. Serum-albumen, on the other hand, suffers a marked diminution, from 5.3% to 21.66% of the normal quantity. A calculation of the probable loss of albumen from the blood and lymph on the basis of his experiments, when compared with the amount of urea excreted by dogs, according to Voit, in the first five days of starvation, shows that the quantity of albumen lost from the circulating liquids is much too small to account for the proteid destruction indicated by the urea. Burckhardt made use of dialysis chiefly in determining the quantity of serum-globulin present in serum. The serum-albumen was estimated as the difference between the total proteids and the serum-globulin. He states that Hammarsten's method of obtaining serum-globulin by means of $MgSO_4$ is not reliable. Complete saturation with $MgSO_4$ throws down not only the serum-globulin, but also a large amount of proteid, which resembles serum-albumen, as usually understood, in every respect except in its precipitation by $MgSO_4$. — (*Arch. exper. path. pharmak.*, xvi. 322.) W. H. H. [31]

Double staining blood-corpuscles. — Dr. Vincent Harris has made a series of systematic experiments on double staining of nucleated blood corpuscles with aniline dyes, and gives in connection therewith a table of the aniline dyes, and their solubility in water and alcohol. A little blood was dried rapidly in a thin layer on a slide, and treated with two dyes in succession. The only entirely successful combinations were the following: rosein and aniline green, fuchsin and methylen blue, fuchsin and Bismarck brown, eosin and resuvin, iodine green and Bismarck brown, Hoffman's violet and Bismarck brown, aniline violet and methylen blue. The greens were not at all permanent. The results were often variable and uncertain. For success the solutions must be quite fresh. The time each dye is allowed to remain greatly affects the results. — (*Quart. journ. micr. sc.*, 1883, 292.) C. S. M. [32]

The primitive mouth of vertebrates. — According to Rauber, the gastrula mouth (original blastopore

or prostoma) is represented by various parts in vertebrates. In *Pretromyzon*, sturgeons, and *Amphibia* it is undivided. In sharks it is divided into two parts; i.e., primitive furrow, and posterior marginal opening. In birds it consists of the primitive furrow and marginal notch of the germinal area, and includes also the various small openings formed at the terminal swelling of the embryo; viz., the neurenteric canal, the passage observed by Gasser in the embryo of the Cochin-China breed of hens, and the break which sometimes occurs between the allantois sack and the ectodermal ingrowth behind the tail (caudal sack).

Rauber also asserts in the same paper that the bilateral outgrowths from the primitive streak of amniote embryos are homologous with the divestacula forming the mesoderm in *Amphioxus*. — (*Zool. anz.*, vi. 143, 163.) [33]

Reptiles.

Venom of serpents.—The constitution of the venom of certain of the poisonous serpents has been examined by Mitchell and Reichert with interesting and somewhat remarkable results. According to them, three distinct proteids may be isolated from the venom of the moccason and the rattlesnake (*C. adamanteus*). These they propose to call respectively, venom-peptone, venom-globulin, and venom-albumen. The venom-peptone may be obtained from fresh venom, or from the aqueous solution of the dried material by dialysis, or by boiling and filtering off from the precipitated proteids. It is soluble in water, not coagulated by boiling, and readily dialyzable. Its solutions, while answering to all the general tests for peptones, exhibit certain peculiar reactions which distinguish it from the class of peptones as usually understood. The most marked of these specific reactions are its precipitation from aqueous solutions by saturation with potassium hydroxide or sodium chloride, and by the addition of dilute acetic acid. Its solutions possess the poisonous properties of venom, though in a less marked degree, giving rise to putrefactive changes when injected into the living animal.

The solution of the peptone obtained by boiling venom, and filtering from the precipitate of coagulated proteids, breaks up on drying with the formation of two proteids, one of which is soluble, and gives all the reactions of the original substance, with the exception that it is not poisonous. The other is insoluble in water, and likewise innocuous.

If an aqueous solution of venom is allowed to stand for some time, a precipitate occurs which gives the usual reactions of globulins. This substance possesses all the toxic powers of fresh venom.

After the separation of the peptone and globulin, a third proteid remains in solution which is apparently closely connected with the albumens, though the authors have not been able to obtain it in a state of sufficient purity to make decisive tests. It is soluble in water, coagulates below 70° C., and is precipitated from its solutions by weak alkalis and acids. It is probably not poisonous. — (*Medical news*, April 28, 1883.) W. H. H. [34]

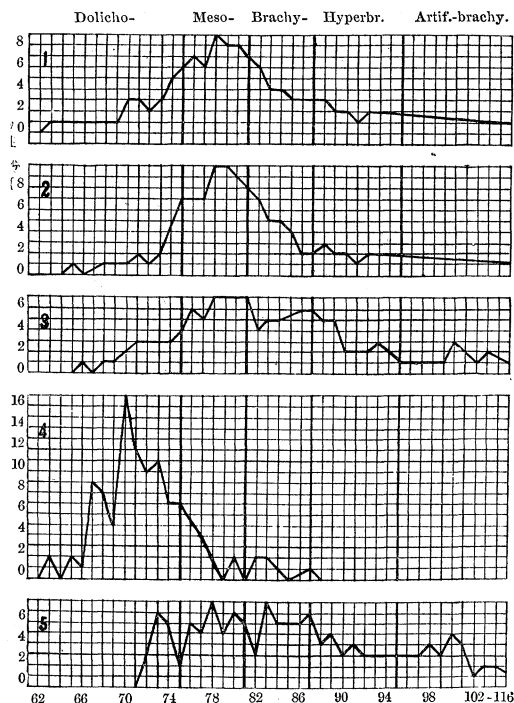
Mammals.

Cutaneous nerves in mammals.—Dr. Harrison Allen has succeeded in tracing nerve-filaments to the larger setae-bearing hair-follicles in mammals as exposed after depilation. He believes that the hair-follicles of the oral, the mental, the supra-orbital and the disto-carpal tufts, as well as those placed on the lateral aspects of the limbs, are in all cases supplied with nerve-filaments, as are the pteryals of birds. In specimens in which the follicles are rudimentary there is a corresponding failure of the nerve, thus indicating a close relation between the two. — (*Acad. nat. sc. Philad.*; meeting June 12.) [35]

Nerves of the human eyelid.—Von Mises describes the results of his studies. The nerves enter in bundles from the sides as well as from above, and are distributed more or less parallel with the blood-vessels, and form a rich plexus along the edge of the lid. Some details are given as to the distribution of the nerves to the conjunctiva. — (*Sitzungsb. akad. wiss. Wien*, lxxxv., abth., iii. p. 172.) C. S. M. [36]

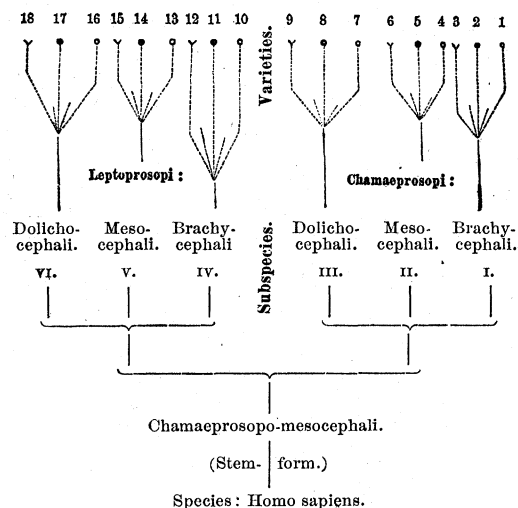
ANTHROPOLOGY.

The autochthones of America.—Dr. J. Kollman of Basel gives his views of American craniology, based on a study of the breadth indices of 1,500 crania, quoted from published measurements, and representing all the countries between Bering Strait and Tierra del Fuego. Five curves are appended,



which reproduce graphically the breadth indices of five groups of American skulls. Curve I. represents 1,292 crania of aborigines of America, whether from

ancient Indian burying-places or picked up on recent battle-fields; curve II., 917 North Americans, including the territories of the United States and British America, with the exception of the Eskimo; curve III., 248 Central and South Americans, including the Mexicans on account of their peculiar civilization; curve IV., 127 Eskimo, consisting of all crania from the arctic regions of North America; curve V., 208 pre-Columbians, discriminated from other North Americans by their manner of burial, i.e., mound-builders and stonegrave people. A study of these teaches, 1°. The plurality of varieties in America; 2°. The diffusion of these varieties over the whole continent. As an illustration, the stonegrave people of Tennessee are cited. Their remains are those of a single people, as Mr. Putnam has shown by the correspondence of their customs, and grade of civilization; while the measurements of their skulls by Mr. Carr show a varying proportion of dolichocephali, mesocephali, brachycephali, and artificially shortened crania. A people is an ethnic unity, which, according to the results of craniology, may consist of an anatomical plurality of races; but a race is an anatomically characteristic variety of the human species. Like the Germans, the mound-builders consist of many races which have combined to an ethnic unity. The term 'race,' as here employed, is equivalent to a sub-species of the species *Homo sapiens* of Dr. Kollman's system, illustrated by the following diagram.



The varieties are distinguished by peculiarities of the hair: 1, 4, 7, being smooth-haired, indicated by the sign ○; 2, 5, 8, etc., straight-haired, by the sign ●; 3, 6, 9, etc., woolly-haired, by the sign V. So far as is known, only straight-haired varieties have immigrated into America, of the following sub-species: 1. Broad-faced dolichocephali (Eskimo); 2. Broad-faced mesocephali (Indians); 3. Broad-faced brachycephali (mound-builders); 4. Long-faced brachycephali (ancient Peruvians).

Like the European, the American varieties of the species *Homo sapiens* have long since passed into the condition of permanent types. The time of elasticity, of the organization of new physically diverse forms, has long gone by. Wherever human remains are found in the glacial formations of Europe, they are as highly organized as to-day. Undoubtedly they represent men of a lower plane of civilization. It is erroneous at every footstep of advance in civilization to infer a new and more highly organized race. Craniology demonstrates that varieties, unchanged physically since the glacial epoch, are continually making their way to higher grades of civilization. — (*Zeitschr. ethnol.*, 1883, 1.) C. A. S. [37]

Madagascar.—The vast island of Madagascar, 960 by 300 miles in extent, is unique in its proximity to a continent with which it has such feeble connections. Its population is about 4,000,000; but it is subject to great fluctuations through epidemics, witchcraft, infanticide, intertribal wars, and murders. The peculiar formation of the island effects a tropical, malarial climate around the coast, and a nearly temperate climate elsewhere. All around the island there is a belt of forest, often splitting into two parts, which enclose fertile valleys teeming with people. The natives are the Hovas, of Malay origin, and the Malagasy proper, of African origin, who for the past hundred years have been augmented by importation of slaves from central Africa. The system of government among the negro tribes is purely African in form. Among the Hovas, however, a queen holds sway, through the agency of a prime-minister, who is *ex-officio* husband of the queen. The religion of all the Malagasy is fetishism, with a shadowy recognition of a superior power. They believe in ghost-souls who are capable of good or harm to us, and this belief leads to great respect for the dead. Their beliefs, witchcraft, burials, roads, commerce, and language have been carefully studied by Dr. G. W. Parker, who has communicated a paper on the subject to the London anthropological institute. The island became known to the Portuguese, Dutch, French, and English early in the seventeenth century; although the Arabs traded there long before that. At the beginning of the present century the Hovas became the firm friends of the English, — a connection which has remained unbroken except during the reign of Queen Ranavalona I. Upon the assassination of her son, Radama II., the present system of queens and prime-ministers began.

The languages belong to the class of purely spoken tongues, no one of them having ever been reduced to writing by the natives. The vowels are *ah, ay, ea, ô, oo*; the consonant sounds, *b, d, f, g, h, j, k, l, m, n, ng, p, r, s, t, v, z*; the diphthongs are *eye* and *ow*.

The number of consonantal combinations is very small, which occasions many euphonic changes in compounds. The meaning of words and sentences depends little on the tone, but much on accent, position, and the discriminative particle *no*.

Onomatopoeia is common. The grammatic structure is quite regular. A large percentage of the words are traceable to verbal and denominative roots, which

are affixed and compounded to an indefinite extent. Gender is indicated by the affixes for male and female, and there is no distinction between animate and inanimate. The numeral system is decimal, and ends with *tapitrisa* (ended are the numbers), the word for a million. There are two moods of the verb,—the indicative and the imperative. There are two classes of personal pronouns,—the inclusive of the speaker, and the exclusive. Other peculiarities in grammar are pointed out by Dr. Parker in an exhaustive dictionary of fourteen dialects, which unite the Malagasy with the Malay stock-language. To account for this anomaly of race and language, Dr. Hildebrand supposes the Hovas to have first settled the island, and to have been overpowered by African marauders, who killed most of the Hova men, and married their wives. The children, learning their language from the mothers, perpetuated at the same time their African blood and their Malay language. But Dr. Parker seriously objects to this explanation. Mr. Keane is of the opinion that the Africans were introduced as slaves, who, while gradually corrupting the blood, would have little effect upon the language. Dr. G. Oppert also commented upon the paper.—(*Journ. anthropol. inst.*, xii. 478.) J. W. P. [38]

The flora of ancient Egypt.—The student of anthropology is repeatedly charmed and surprised by the varied and brilliant illumination thrown upon his subject by sister sciences. He is not less pleased to know that quite frequently the light proceeds in the other direction, and that human custom preserves for other sciences their sibylline leaves. In 1881 Emil Brugsch Bey discovered in the vault of a king of the twentieth dynasty a large number of plants contained in the funeral offerings, repasts, and wreaths of the dead. Among these are several species not known to have belonged to ancient Egypt. Mr. G. Schweinfurth, deputed by M. Maspero, has studied these plants, and classified them in the Egyptological museum of Boulak, according to the high personages for whom they were intended. A very extended and interesting account of these labors was communicated to Sir Joseph D. Hooker, together with a set of the wreaths, flowers, etc., described. Excellent illustrations accompany the paper of Mr. Schweinfurth. These objects were exhibited at the annual *soirée* of the Royal society on the 25th of May, and are now on view at the Royal gardens, Kew.—(*Nature*, May 31.) J. W. P. [39]

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

STATE INSTITUTIONS.

Missouri weather service, St. Louis.

Weather report for May.—The average temperature for May at the central station has been 63.4°, which is 2.8° below the normal temperature, and 3.5° above the temperature of May, 1882. Since 1837 the May temperature has fallen below that of last month five times. The extremes during last month at the central station were 38.0° and 88.4°; although, in the suburbs of St. Louis, the temperature fell to 36.0° on the evening of the 21st. In 1851 Dr. Engelmann observed a temperature of 29.0° in May, but it was in the early part of the month. The lowest minimum temperatures reported were, 29.5° at Centreville; 31.0°, at Big Creek, Warren county; 32.0°, at Steelville; all other stations reporting over 34.0°. The highest minimum temperatures are reported from Glasgow, 45.0°, and Harrisonville, 47.0°. The highest maximum temperatures reported were, Corring, 91.0°; Miami, 98.0°; Harrisonville and Big Creek, 90.0°. The highest average temperatures reported were, Cairo, Ill., 65.2°; Mascoutah, Ill., 65.0°; Harrisonville, 64.0°; the lowest being at Keokuk, Io., 59.9°; Macon, 60.4°; Louisiana, 60.5°.

The rainfall at the central station was 2.61 inches, which is 2.2 inches below the normal May rainfall at St. Louis. In western Missouri, however, from Harrisonville northward along the Missouri valley, the rainfall has been over seven inches; and a small maximum of over seven inches occurs in the region around Iron-ton. An area of minimum rainfall of between two and three inches occurs in south-west Missouri,

around Greenfield and Lamar, and another occurs along the lower Missouri below Chamois, extending along the Mississippi as far south as Cairo.

On the 13th, tornadoes occurred at various points in Missouri and Kansas, as follows: the town of Oronogo, Jasper county, was destroyed at about 7.40 p.m., two persons being killed, and forty injured. This tornado is probably the one which passed about two miles north of Carthage. Hailstones as large as hen's eggs fell at Springfield at about 10 p.m. Another storm passed two miles south-east of Pattonville, Davies county, on the same evening. Two tornadoes passed through Kansas City at 5 o'clock, one passing a few minutes later than the other. Several persons were killed, and a great deal of damage was done to property. These whirls were slender whip-like vortices, the diameter at the surface of the earth being only a few feet, although the destructive path was about seventy feet. These storms originated apparently in Wyandotte county, Kan., where they caused great damage. A later development of this storm passed through Macon City, one hundred and twenty miles east-north-east from Kansas City, where a tornado occurred about 8.30 p.m. The track was from one-fourth to three-eighths of a mile wide. Three persons were killed at Macon.

On the 18th, tornadoes occurred in Missouri, Illinois, and Wisconsin. At 7 p.m. a tornado did considerable damage at Berger, Gasconade county, Mo. At about 8.20 p.m. a tornado passed through Wentzville from the south-west, causing great destruction to property, and loss of life, as far as St. Paul, Mo. At about the same time a storm passed from Cottle-

ville, through Elm Point, to Grafton, on the Illinois shore of the Mississippi River.

Hail-storms have occurred as follows: at Big Creek, 10th; Centreville, 9th; eight miles north of Savannah, 3d; Hannibal, 9th; Louisiana, 9th and 10th (and at Springfield and Dover church, near Louisiana, large hail fell on the afternoon of the 18th); Lamar, 3d; Chamois, 9th, — a violent storm of wind and hail at 7 P.M., for seven to ten minutes, the hail completely covering the ground, some stones weighing six ounces. On the 18th, at 5.50 P.M., a dark cloud in the south-west moved to the west with a heavy roaring noise, appearing to spend its force when due west, rain and small hail following.

Killing frosts occurred on the nights of the 21st and 22d. At Big Creek great damage was done to wheat, corn, and fruit. At Centreville, at 9 P.M., on the 21st, the temperature was 32°, and fell later to 29.5°, — the latest frost in sixteen years. Fog prevented damage in the valleys of the Black River, but in the dry valleys every thing was killed. Louisiana, 32° at sunrise on the 22d; Chamois, destructive frost with ice an eighth of an inch thick in a pan of water; Greenfield, heavy frost, which injured foliage of forest-trees so that they looked as though scorched by fire.

White frosts occurred at Hannibal, Greenfield, Mexico, Chamois, 5th; Hannibal, Louisiana, Chamois, Miami, 11th; Iron-ton, 16th; over the entire state, 21st and 22d, but light in the south-west, where the temperature was about 40°; Mexico, Iron-ton (33° at 5.30 A.M.), Louisiana, Chamois, Miami, Greenfield, 23d; Sedalia, Centreville, Greenfield (heavy), Iron-ton, Chamois, Miami, 31st.

ADDENDUM to April report. — At Cairo a heavy shock of earthquake was felt at 2.36 A.M. on the 12th, which lasted thirty seconds. Vibrations, three per second, from south-south-west to north-north-east. An old one-story frame-building, which was occupied at the time the shock occurred, was shaken down and collapsed, the inmates receiving slight injuries.

Iowa weather service, Iowa City.

Weather bulletin for May. — May was remarkably cold, very rainy, with late frosts, westerly and northerly winds prevailing. The mean temperature of the air was nearly five degrees below normal. In forty-five years, May has been six times as cold or colder than this year; namely, in 1882, 1867, 1858, 1851, 1850, and 1849. The late frosts about the 12th and 22d were general.

The rainfall was much above normal throughout Iowa, except in middle northern Iowa and down the middle Cedar and Wapsipinicon valleys. The total rainfall was highest along the Mississippi and Missouri rivers, and from Wayne to Polk county: in the regions here specified, the rainfall averaged seven inches. The rain frequency was also high: two of every three days were rainy in most parts of the state.

The principal storm-days were the 8th and 9th, the 13th and 14th, 17th and 27th. On the 9th a very small tornado did slight damage in Linn county, near Norway station: on the other storm-days, Iowa was

spared the visitation of tornadoes, which struck, on the 13th, Kansas City; 18th, Racine; 28th, southern Indiana.

While unusually cold and quite wet, the season is much more promising than last year, when May was much colder.

NOTES AND NEWS.

Stephen Alexander, professor emeritus of astronomy at Princeton, died June 26. He was born at Schenectady, N.Y., and was educated at Union college, where he graduated in 1824. Since 1840 he has been connected with Princeton, first as professor of astronomy, and later as professor of mechanics as well. As an astronomer he became widely known.

— Sir Edward Sabine, whose death has been lately announced, was born in Dublin, in October, 1788. He studied at the military schools of Marlow and Woolwich, and at the age of fifteen entered the English army. In 1813 he was made captain, and took part in the campaign on the Niagara frontier, commanding the batteries at the siege of Fort Erie, 1814. From 1818 to 1825 he made a number of voyages from the equator to the arctic regions for the purpose of studying terrestrial magnetism, the figure of the earth, and other questions in terrestrial physics. He was with Ross and Parry on the arctic expedition of 1818, and with Parry the following year. He edited a number of translations of scientific books, and published a large number of papers on his favorite studies, having read more than forty before the Royal society, and having contributed many to the proceedings of the British association. From 1827 to 1830 he was secretary of the Royal society, and president for the ten years 1861 to 1871, and president of the British association in 1853. In 1875 the French academy elected him as a corresponding member.

— A few weeks ago (April 26) *Nature* gave a sketch of the life of Spottiswoode. In the number for June 14 we find a regret expressed at his absence, on account of sickness, from the Royal society meeting of that week. On June 27 he died. Born in London, Jan. 11, 1825, he began his education in a private school at Laleham, and then at Eton and Harrow; his stay at Eton being short on account of some experiments with detonating mixtures, in which he was found to be interested. In 1842 he entered Balliol college, Oxford, where, in his last year (1845) as undergraduate, he read with the Rev. Bartholomew Rice. After graduation he held university mathematical scholarships for two years, and for a short time lectured on geometry of three dimensions. But he soon took an active part in the management of the large printing-business about this time resigned to him by his father, and which he largely developed. His scientific work was mainly in mathematics, although of late years he has devoted himself to physics, his recent investigations in electricity being well known. When a young man, he travelled widely, and, among others, published a very lively account entitled "A Farantasse journey through

eastern Russia in the autumn of 1856." He also studied languages, both oriental and European, and gave evidence of the thoroughness of these studies in his contributions to our knowledge.

—The Dickson expedition, in charge of Professor Nordenskiöld, which left Thurso May 29, is reported as having called at Reikiavik, Iceland, June 6, and was to sail for Greenland on the 10th. When the expedition started, it was the intention that Count Stromfeldt (botanist), Dr. Arpi (philologist and archeologist), and Mr. Flink (mineralogist) should disembark at Reikiavik, and remain in Iceland for study and exploration. It is reported by recently arrived whalers that the condition of the seas west from Iceland, as regards ice, is at present not unfavorable to the success of the expedition. The *Sofia*, upon which the party is embarked, is a little iron propeller of less than two hundred tons, capable of a speed of eleven knots, and draws ten feet of water, —a vessel much better suited to her purpose than the unwieldy craft which have been used in many of the English expeditions. It was originally intended that Palander should command the *Sofia*, but circumstances intervened to prevent this; and the vessel has been intrusted to Capt. Emil Nilsson, who is well qualified by experience, and who will be ably seconded by the well-known Norwegian ice-master, Johannesen. The scientific staff does not comprehend any of the members of the Vega expedition, who are mostly engaged in working up the investigations made on that voyage, but, after Baron Nordenskiöld, is composed of Dr. Kolthoff, entomologist and ornithologist; Dr. Nathorst, geologist and paleontologist; Dr. Berlin, surgeon, botanist, and general biologist; Mr. Forstrand, taxidermist and preparator; Dr. Hamberg, hydrographer; Mr. Kjellström, photographer. Beside these, there are a harpooner, two mountain Lapps (in accordance with the suggestion of Professor Fries, to which we have already alluded), and eight or nine picked men, to accompany the party over the inland ice. This party will be provided with fourteen months' provisions in the most compact shape possible. The crew of the *Sofia* comprises twenty-four men. The party is thoroughly equipped with scientific apparatus, and even includes a flying-machine contributed for trial by its inventor, according to the Swedish papers.

—Among the most interesting of the living animals in the gardens of the London fisheries exhibition are two British-born beavers from the Isle of Bute in Scotland. They were members of a colony established by the Earl of Bute upon his estate of Rothesay several years since. A considerable tract of land was walled in, and beavers were imported from Canada, which soon established themselves, gnawing down the trees, building a dam, and forming a lake of considerable size. The 'beaver wood' is considered one of the most interesting features of the island. Mr. R. B. Matthews writes to the *Field*, complaining, that, in capturing the two beavers to send to the exhibition, the colony has been broken up, the dams destroyed, the houses pulled down, and all the other beavers killed. It is to be hoped

that the damage is not so serious as is represented, for the acclimation of the American beaver in Scotland is a task which is not likely to be often attempted.

—The next issue of the Proceedings of the naval institute (vol. ix. no. 3; whole no. 25) will be entirely devoted to an article by Lieut. Edward W. Very, on the development of armor for naval use. The number will thus be a complete work of itself, fully illustrated, and will possess more than ordinary interest in being the only work extant devoted exclusively to the details of armor development. Orders for this number should be sent to the secretary U. S. naval institute, Annapolis, Md., as early as possible. Price \$1.

—The extraordinary meeting of the geological society of France for this year is to take place at Charleville (Ardennes) on Sunday, Sept. 2, and the excursions will end Tuesday, Sept. 11.

—The yearly meeting of the Schweizerischen naturforschenden gesellschaft will take place from the 6th to the 9th of August in Zurich, where the national exposition is attracting many people this year.

—G. Valentin, for forty-five years professor of physiology at the university of Berne, died on the 24th of May at the age of seventy-three. He was a native of Breslau. He was formerly one of Louis Agassiz's collaborators; and the fourth *livraison* of Agassiz's 'Monographies d'échinodermes vivants et fossiles', containing the anatomy of the genus *Echinus*, is by Valentin.

—Past assistant-engineer N. B. Clarke, U. S. N., read a paper on water-line defence and gun-shields for cruisers, at the meeting of the U. S. naval institute (Washington branch) on June 7.

—The bureau of education has issued, as one of the 'circulars of information,' a pamphlet containing the legal provisions respecting the examination and licensing of teachers.

—A contributor's note in the *Atlantic monthly* for June calls attention to the question of the spelling and pronunciation of geographic names, on which several articles have lately appeared in foreign journals. The question is not always settled by adopting local spelling and sound, for in many cases foreign names are well Anglicized, and will so remain; the difficulty is rather in knowing where to begin using the original pronunciation. As we do not say *Paree* and *Bairleen*, why may we not say *Prague* and *Hague*, even though we do drop a visible *s* from *Calais*, and attempt the difficulties of *Rouen*, *Amiens*, *Chartres*, and *Blois*? As to *St. Petersburg*, the error of sanctification is not ours, but the Russians', from whom we have taken it. Our mistake, if it be one, is in putting an *s* after *Peter*, for this seldom occurs in the original. A similar but incorrect addition is often made in *Prince Edward Island*. The back-and-forth method of naming seen in the German *Vogesen*, which the contributor explains as coming from the original German *Wassigen* (watery), through the French *Vosges*, is found again in the same polyglot borderland in the *Laacher See*.

—The Comisión del mapa geológico de España has just published, for the Exposición de minería at Madrid, a brief account of the history of the survey from its beginning, about the year 1831, under D. Angel Vallejo, down to the present time. Two maps show the condition of the work in March, 1873, at the beginning of the present system of the survey, and in March of the present year, showing how great an amount of work has been done in the last ten years. Eighteen provinces are finished; viz., Oviedo, Madrid, Santander, Castellon, Albacete, Murcia, Teruel, Cadiz, Zaragoza, Cuenca, Cáceres, Valladolid, Huesca, Avila, Salamanca, Guadalajara, Barcelona, and Valencia. More or less has been published concerning twenty-three other provinces, but their full descriptive memoirs are still to appear; viz., Cbruña, Lugo, Orense, Pontevedra, Segovia, Palencia, Balears, Alicante, Burgos, Logroño, Soria, Alava, Guipúzcoa, Vizcaya, Tarragona, Huelva, Toledo, Badajoz, Cordoba, Ciudad-Real, Granada, Navarre, and Almeria. Seven provinces are entirely unpublished or under study; namely, León, Lérica, Zamora, Málaga, Gerona, Jaén, and Sévilla. A rough draught of the final map, on the scale of 1 : 400,000, is shown in the exposition, upon which all the work done up to date is entered.

—The Belgian photographic association has organized an international exhibition of photography to be held, during the month of August, 1883, in the palais des beaux-arts at Brussels.

—The sixth international congress of orientalists will be held at Leyden, Sept. 10.

—The international congress of societies for the prevention of cruelty to animals will be held at Vienna in September. A number of local societies, among them those of Berlin, Cologne, Munich, Drésden, and Hanover, besides several Spanish Italian, and Russian, have expressed their intention to be represented.

—The British association for the advancement of science meets this year at Southport, Sept. 10.

—Dr. William Lee read before the Philosophical society of Washington, June 2, a paper on medical history as illustrated by medals; Prof. Theo. Gill discussed analogues in zoögeography. The society then adjourned till October.

The Mathematical section of the society adjourned for the summer on June 6. At the last two meetings, Mr. G. W. Hill discussed the planetary perturbations of the moon, Mr. G. K. Gilbert explained the construction of graphic tables for use in connection with his new method of determining heights from barometric data, and Mr. E. B. Elliott gave an improved system of electrical units.

—An excursion to northern Norway and Spitzbergen is projected for some of the students at the Paris École des mines. Two French naturalists will accompany the party, which will charter a steamer directed by a competent arctic navigator for the purpose.

—Professor Fries has proposed the colonization of Greenland by Lapps, on the hypothesis that in the interior, in summer, abundant reindeer-pasture can

be found. How the reindeer are to get at it does not seem to have been considered, nor how they are to be subsisted during their travels over the continental ice-sheet.

—Mr. Oliver W. Huntington, assistant in the chemical laboratory of Harvard college, has edited a book of five-place logarithms, which will finally form part of a set of tables mostly for use in chemical calculations, but is now published in separate form. The logarithm tables are well arranged, and very clearly printed. The book is published by Moses King, Cambridge.

—The museum at Oxford, Eng., has lately bought the unique collection of Silurian fossils of Dr. Grindrad of Malvern.

—It is rare to find, at the present time, a scientific memoir in Latin. Aloysius Molina, a student at Pisa, has, however, recurred to the ancient custom, and has published a memoir, 'De hominis mammalliumque cute,' in volume v. of the *Atti della società Toscana*. The opening sentence sufficiently describes the paper: "Expectans dum Ranvierus in lucem perfecte proferat conclusiones omnes suarum investigationum de intima structura cutis, prodesse existimo breviter quae praecipua facta sunt resumere, nonnullas considerationes addens, quas ipse feci dum per duos annos ad Anatomicam Scientiam meum adhiberi studium in Laboratorio Anatomiae Comparativae hujus universitatis." The 'nonnullas considerationes, quas ipse feci' one finds not very numerous, the chief value of the paper being as a summary. A good bibliography is appended.

—Much progress has been made at the Lick observatory during the past year. The dome for the twelve-inch equatorial has been entirely completed in a very thorough manner. It is, without any doubt, the most convenient and complete dome of the size in the country. The four-inch transit-house, and the buildings for the photoheliograph, are in capital working order. They were utilized last December in a very successful observation of the transit of Venus. The walls of the main building are half done, and the cellar for the dome of the thirty-six-inch equatorial is excavated. Many of the original arrangements of the buildings and grounds were only provisional, and these are being replaced by others more substantial and permanent. A brick reservoir containing 83,000 gallons of water (derived from three springs) has been built during the season; another of 20,000 gallons (spring-water), and another of 83,000 gallons (rain-water), will shortly be begun. The roads have been extended. The house for the meridian circle (Repsold) will be begun in a few weeks, as well as a house for the astronomers, and buildings to contain the appliances for heating and lighting the buildings and moving the dome. The end of this season will show great progress.

—The division of entomology of the U. S. department of agriculture has begun the publication of a series of bulletins for the purpose of placing before the public, current matter that would either lose much of its value if kept for the annual report, or find no space in the limited pages of that volume.

Two numbers have been issued. The first includes reports of experiments, chiefly with kerosene, upon the insects injuriously affecting the orange-tree and the cotton-plant. The second includes reports of observations on the Rocky Mountain locust and the chinch-bug, together with extracts from the correspondence of the division on miscellaneous insects.

—The University of Pennsylvania has conferred the degree of M.A. on Professor Lewis M. Haupt, C.E.; and of Sc.D. on Professor Isaac Sharpless, professor in Haverford college.

—At the meeting of the Royal astronomical society, May 11, Professor C. Pritchard of Oxford gave an account of his recent expedition to Cairo, and of the work on which he has for the last two years been engaged; viz., the measurement of the magnitude of the stars visible to the naked eye from the pole to the equator, including at present all those brighter than the fifth magnitude. This work is now complete. He found, that, at Oxford, Laplace's law of alteration of a star's light as measured in magnitude—according to the secant of the star's zenith distance—did not hold good for zenith distances exceeding 65°, and that for stars at lower altitudes the alterations in apparent magnitude were conflicting and not satisfactory. For the purpose of accurately investigating the effect of atmospheric extinction of light under better circumstances, he chose the climate of Upper Egypt, where the atmosphere is uniform and stable, as the proper locality for repeating the Oxford observations, and rendering the research complete. A duplicate set of instruments was left at Oxford in charge of the senior assistant, who observed the same stars with Professor Pritchard at Cairo. The results of both sets of observations are embodied in the formulæ,—

Atmospheric absorption

At Cairo = $0.187 \times \text{Sec. Z.D. in magnitude}$;

At Oxford = $0.253 \times \text{Sec. Z.D. in magnitude}$.

Thus the whole effect of the atmosphere at Cairo is to diminish the brightness of stars seen in the zenith by about two-tenths of a magnitude, and at Oxford by about one-fourth of a magnitude. At an altitude of about 30°, the stars at Cairo will be brighter than in England by about one-fifth of a magnitude, and consequently many more faint stars are just visible at Cairo than can be seen at Oxford.

—Alexander Melville Bell has written a primer, which will soon be published, for use in elementary schools in teaching the methods of visible speech. The book can be used by any teacher without special training in the peculiarities of the system.

—A correspondent states that the shortest scientific article known to him, and perhaps the shortest ever published, is by William Griffith, in the bulletin of the U. S. fish-commission for 1882, p. 12, under the title 'Result of planting shad in the Ohio River.' The article contains twenty-six words, and occupies two lines.

—At the meeting of the Cambridge entomological club, June 8, Mr. S. H. Scudder discussed the homologies of the male abdominal appendages of butter-

flies, and Mr. G. Dimmock showed a living *Buthus occitanus*, and described some of its habits.

—The Argentine government has sent Col. Solá, with a party of two hundred soldiers, to explore the Pilcomayo in its course through the Gran Chaco. The party is accompanied by a delegate of the Argentine geographic institute, whose chief object is to discover the remains of Crevaux, and ransom two of his men who are reported to be held as prisoners by the Indians.

RECENT BOOKS AND PAMPHLETS.

***Continuations and brief papers extracted from serial literature without repagination are not included in this list. Exceptions are made for annual reports of American institutions, newly established periodicals, and memoirs of considerable extent.*

Adam, L. Les idiomes négro-aryen et maléo-aryen, essai d'hybridologie linguistique. Paris, *Maisonneuve*, 1883. 76 p. 8°.

Bisson, E. Nouveau compas de mer donnant la direction vraie du méridien magnétique sur les navires en fer. Paris, *impr. Chaix*, 1883. 20 p., 4 fig. 8°.

Boutillier, L. Des corallaires à madrépores et de leur action géologique. Rouen, *impr. Cagniard*, 1883. 30 p. 8°.

Camoy, J. B. Biologie cellulaire: étude comparée de la cellule dans les deux règnes au triple point de vue, anatomique, chimique et physiologique. Aachen, *Barth*, 1883. 8°.

Crié, L. Les origines de la vie, essai sur la flore primordiale; organisation, développement, affinités; distribution géologique et géographique. Paris, *Doct*, 1883. 79 p., illustr. 8°.

Crozals, J. Les Peulhs, étude d'ethnologie africaine. Paris, *Maisonneuve*, 1883. 271 p. 8°.

Desdevises du Dezert, T. Le noyau central et les marches de la langue d'oïl. Rouen, *impr. Cagniard*, 1883. 28 p. 8°.

Duguit, L. Quelques mots sur la famille primitive, conférence faite à Bordeaux, le 16 mars 1883. Paris, *Larose*, 1883. 32 p. 8°.

Elsner, F. Recepte für pharmacie und chemische grossindustrie. Halle, *Knapp*, 1883. 9+216 p. 8°.

Fabre, J. H. Cours de physique (programmes de 1882). Paris, *Delagrave*, 1883. 304 p., illustr. 18°.

Ferri, L. La psychologie de l'association depuis Hobbes jusqu'à nos jours (histoire et critique). Paris, *Baillière*, 1883. 4+382 p. 8°.

Fricero, A. Considérations diverses sur l'emploi des huiles minérales lourdes dites oléonaphtes comme lubrifiants. Marseille, *impr. Grangé*, 1883. 12 p. 8°.

Greer, H. Recent wonders in electricity, electric lighting, magnetism, telegraphy, telephony, etc., N.Y., *Agent Coll. electr. eng.*, 1883. 168 p., illustr. 8°.

Guyot, A. Memoir of Louis Agassiz, 1807-73. Princeton, *Robinson pr.*, 1883. 49 p. 8°.

Instructions relatives à l'établissement des pépinières de vignes américaines. Paris, *impr. nat.* 1883. 36 p. 8°.

Le Breton, G. La céramique polychrome à glaçures mét. alliques dans l'antiquité. Rouen, *impr. Cagniard*, 1883. 45 p. 8°.

Leplay, H. Chimie théorique et pratique des industries du sucre: étude historique, chimique, et industrielle des procédés d'analyse des matières sucrées, etc., suivie de la description d'un nouveau procédé d'analyse chimique industrielle des matières sucrées. T. I. Paris, *Baudouin*, 1883. 28+452 p. 8°.

Marin La Meslée, E. L'Australie nouvelle. Paris, *Plon*, 1883. 12+298 p., illustr. 18°.

Quenstedt, F. A. Die ammoniten der schwäbischen Jura. i. heft, mit ein atlas. Stuttgart, *Schweizerbart*, 1883. 48 p., illustr. 8°.

Schneider, A. Zoologische beiträge. i. band, i. heft. Breslau, *Kern*, 1883. 3+63 p., 12 lith. 8°.

Tellier, C. Étude sur la thermo-dynamique appliquée à la production de la force motrice et du froid. fasc. i. Paris, *impr. Mouillot*, 1883. 7+97 p. 8°.

Thompson, D'Arcy W. A catalogue of books and papers relating to the fertilization of flowers. London, *Macmillan*, 1883. (2)+36 p. 8°.